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LEHMANN (H. C.). **Luzerneschädlinge. 5. Der Massenwechsel (Gradation) der Luzerneblüten-Gallmücke** (*Contarinia medicaginis* **Kieffer) und seine Vorhersage.** [Lucerne Pests. 5. Variation in Abundance of the Lucerne Flower Gall-midge, *C. medicaginis*, and its Prediction.]—*Z. PflKrankh.* **49** pt. 4 pp. 258–267, 13 refs. Stuttgart, 1939.

The Cecidomyiid, *Contarinia medicaginis*, Kieff., a serious outbreak of which occurred in the lucerne fields of Thuringia in 1937, depends for its continued existence on the lucerne left standing for seed. Both food-plant and pest are therefore dependent on the same environment. Investigations are described on the conditions of rain and insolation most favourable for seed production and those most favourable to the gall-midge, other factors being of merely local importance.

The author's main conclusions are as follows: From July–August to the following June the larvae are present in the upper layers of the soil and during this period are very susceptible to protracted dry weather. The abundance of *C. medicaginis* depends chiefly on soil moisture and insolation. The midge may be expected to be abundant if the rainfall from March to June inclusive is much above the average and if there is little sunshine in the spring months, especially in April. Infestations will not be severe if these months are dry and very sunny. The critical amount of rainfall in Thuringia from 1st March to 30th June appears to be about 4·8 ins. Rainfall under 4 ins. always induces a mass destruction of the larvae, particularly if April is characterised by much sunshine.

KIRCHNER (H. A.). **Laufkäferschäden an Erdbeeren.** [Injuries to Strawberries by Carabid Beetles.]—*Z. PflKrankh.* **49** pt. 4 pp. 267–271, 6 figs., 5 refs. Stuttgart, 1939.

References in the literature to injuries caused to strawberries by the feeding of Carabids are briefly reviewed, and an account is given of observations in Mecklenburg in 1936 and 1937. The species found in strawberry fields were *Carabus auratus*, L., *C. cancellatus*, Illig., *Harpalus rufipes*, DeG. (*Pseudophonus pubescens*, Müll.), *H.* (*P.*) *griseus*, Panz., *Pterostichus* (*Omaseus*) *vulgaris*, L., *Anisodactylus binotatus*, F., and *P.* (*Poecilus*) *cupreus*, L. *Pterostichus cupreus* was the only species that climbed onto the strawberry plants, but it did not injure the fruits. The two species of *Harpalus* attacked the seeds, *P. vulgaris* and *A. binotatus* fed on both seeds and pulp, and the others ate out deep holes in the pulp, particularly of ripe fruits. Fruits much above the soil were not attacked. These beetles may be captured in artificial shelters, or trapped in pots with smooth sides sunk level with the ground; such pots should be examined weekly.

BUHL (C.). **Beitrag zur Frage der Einwirkung von Ueberschwemmungen auf Maikäferengerlinge** (*Melolontha melolontha* **L.).** [A Contribution to the Question of the Action of Floods on Larvae of *M. melolontha*.]—*Z. PflKrankh.* **49** pt. 4 pp. 271–275. Stuttgart, 1939.

In view of the statement that prolonged flooding in summer controls the larvae of *Melolontha* spp. [*R.A.E.*, A **26** 521], observations were made in fields in Prussian Silesia infested by larvae of *Melolontha*

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melolontha, L., that had been flooded to a depth of over 2 ft. for 11 days in September 1938. The results showed that an average of only 18 per cent. of the larvae had been killed. There were still about 18 larvae per square yard 47 days after the flood, whereas 7–8 are sufficient to cause serious losses.

BODNÁR (J.). **Vergleichende biochemische und chemische Versuche mit Mineralölemulsion, Nikotin und Kaliseife gegen Blattläuse.** [Comparative biochemical and chemical Experiments with Mineral Oil Emulsion, Nicotine and Potash Soap against Aphids.] —*Z. PflKrankh.* **49** pt. 4 pp. 276–281, 6 refs. Stuttgart, 1939.

Of recent years, the use of mineral-oil emulsions as summer sprays at 0·5–2·5 per cent. strength has been suggested against various pests, including Aphids, in Hungary. As a result of experiments in 1936 in which leaves of rose, peach, plum and cherry infested with Aphids were sprayed with or dipped in mineral-oil emulsions at 0·5, 1, 1·5 and 2 per cent. and the resulting mortalities compared with those given by potash-soap solutions containing from 0·025 to 0·1 per cent. nicotine, the author concludes that mineral-oil emulsions are of very little value as summer sprays against Aphids as their action is too weak.

In experiments on the effectiveness of these emulsions in combination with nicotine, leaves of peach infested with Aphids were dipped into mixtures of various amounts of nicotine in either 1 per cent. mineral-oil emulsion or 0·2 per cent. potash-soap solution. In the former, 100 per cent. mortality after 2 hours was given by 0·1 per cent. nicotine, but in the latter by 0·05 per cent. Nicotine acted on Aphids more as a contact than a respiratory poison. Mineral-oil emulsions of up to 2 per cent. strength were in general harmless to plants, although on some peach trees there was a temporary withering and slight fall of leaves. Roses were more sensitive to them, and emulsions of 0·5–1 per cent. strength caused some scorching of the leaves.

JANCKE (O.). **Der Wert der Fanggürtel im Kampf gegen den Heu- und Sauerwurm.** [The Value of Trap Bands against the Spring and Summer Generations of the Vine Moths.]—*Deutsche Weinb.* **17** pp. 730–732, 1938. (Abstr. in *Z. PflKrankh.* **49** pt. 4 pp. 295–296. Stuttgart, 1939.)

A brief account is given of experiments with trap bands of corrugated cardboard against the larvae of the spring and summer generations of the vine moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] in a district in the Rhineland. The results showed that the bands are unlikely to be of use against the spring larvae, for as a rule only 30 per cent. pupated in them, the others doing so among the leaves and clusters. It is, however, possible to capture on an average 94–98·5 per cent., and sometimes even 100 per cent., of all the summer larvae on the vine stocks.

PUSSARD (R.). **Un nouveau ravageur du chou-fleur** *Rhytidoderes plicatus*, **Ol. (Col. Curculionide).**—*C. R. Acad. Agric. Fr.* **25** no. 8 pp. 355–359. Paris, 1939.

Larvae observed damaging the roots of cauliflower in Bouches-du-Rhône, France, were found to be those of *Rhytidoderes plicatus*, Ol.,

a weevil that is common in the south of France, Corsica and North Africa, but has not previously been reported as attacking crops. The injury was first observed in 1928 and was particularly serious in 1937 and 1938. The eggs are laid on the surface of dry light soil, and the larvae bury themselves 16, 20 and even 24 ins. deep in loose earth, as many as 128 having been found round the roots of one plant. They feed on the roots, and sometimes occur in the galleries of *Ceuthorrhynchus pleurostigma*, Marsh. The weevils feed on the edges of the leaves, the tender parts of the petioles, and sometimes on the inflorescence of the plant, which wilts and ceases to develop. Cauliflowers of Dutch varieties harvested at the end of October and in November seem the most susceptible to attack, because they are unable to recover since they do not replace the injured roots by growing new ones above them. Cabbages are also liable to attack.

The intensive cultivation of early potatoes and cauliflower in rich, light soils favours the increase of the weevil, and it is suggested that in infested fields this practice should be abandoned for a few years, and that stems and roots should be destroyed immediately after the harvest.

FANTHAM (H. B.). *Nosema cactoblastis*, **sp. n., and** *Nosema cactorum*, **sp. n., Microsporidian Parasites of Species of** *Cactoblastis* **(Lepidoptera) destructive to Prickly Pear.**—*Proc. zool. Soc. Lond.* (B) **108** pt. 4 pp. 689–705, 1 pl., 30 refs. London, 1939.

Descriptions are given of *Nosema cactoblastis* and *N. cactorum*, spp. n. *N. cactoblastis* is the Microsporidian that was observed infesting *Cactoblastis cactorum*, Berg, in South Africa [*cf. R.A.E.*, A **26** 202], and *N. cactorum* was also taken there from larvae of a closely related species of *Cactoblastis* [*doddi*, Heinr.] previously considered to be *C. bucyrus*, Dyar [*cf.* **24** 379] that was imported from Argentina into South Africa for the control of prickly pear [*Opuntia*], but did not thrive either there or in Australia. The parasites appeared to be specific to their hosts, but one doubtful case of double infection occurred in a larva of *C. cactorum*. The spores of these parasites are compared with those of other members of the genus that have been recorded from Brazilian Lepidoptera and South African Lepidoptera and Hymenoptera, and the host-parasite relations and host specificity of *Nosema* are discussed.

The distribution of the parasites in larvae, pupae and adults of *C. cactorum* and the larvae of the other species of *Cactoblastis* and their developmental cycles are described. They were most numerous in the Malpighian tubules. Infection takes place through contact with infected material [*cf.* **26** 202] and is carried over from the larval to the pupal and adult stages ; it may also be hereditary, but proof of this was not possible from the material available. Infected females often die without ovipositing or when only a few eggs have been laid. Attempts made in Canada to infect 10 larvae of *Pieris brassicae*, L., with *N. cactoblastis* by injection of spores or by allowing them to feed on infected lettuce were inconclusive, a few spores being found in two of the larvae.

BOYCE (A. M.) & PRENDERGAST (D. T.). **Control of Citrus Red Mite (Spider).**—*Calif. Citrogr.* **23** no. 9 pp. 370, 398–400. Los Angeles, 1938.

Some of the information in this review of measures for the control of *Paratetranychus citri*, McG., on *Citrus* in southern California is

similar to that already noticed [*R.A.E.*, A **24** 419]. The eastward range of the mite has increased during recent years, and in many cases infestations of only medium intensity have been followed by severe injury, including excessive leaf-fall on orange and lemon trees, poor set of orange fruits and heavy falls of ripe navel oranges.

A single application of an oil spray made not earlier than September will usually afford effective control of the mite for 8–10 months, and will also reduce infestations by the black scale [*Saissetia oleae*, Bern.] and sometimes by the red scale [*Aonidiella aurantii*, Mask.] and purple scale [*Lepidosaphes beckii*, Newm.], but the use of oil is limited by the adverse effect on the trees of more than one treatment at the full rate during a year, which is insufficient for control in certain areas in which climatic conditions favour the increase of the mite, and by the possibility in some districts of subsequent serious losses of ripe navel oranges from water rot [*cf.* **25** 38].

During investigations begun in 1933 to develop safer methods of control, satisfactory results were at first given by a potassium ammonium seleno-sulphide (Selocide) [**21** 565 ; **24** 419], but the use of substances containing selenium on *Citrus* later appeared inadvisable [*cf.* **26** 131], and studies with this compound were discontinued. Experimental and commercial trials with 0·5–0·66 per cent. light-medium oil containing rotenone-bearing substances demonstrated that a thorough application at this rate in spring is generally as toxic to all stages of the mite except the egg as one at the full rate, and that this is probably the safest treatment at this season. Mortality in the egg stage appears to be directly related to the amount of oil deposited and to the nature of the deposit, and the period for which satisfactory control is maintained is determined by the conditions prevailing after treatment ; an average of three months may be expected. This method is expensive when used against the mite alone, but is economically practicable as a combined measure against *Paratetranychus*, the citrus Aphid [*Aphis spiraecola*, Patch] and *S. oleae* in the spring.

Sprays containing lime-sulphur are liable to cause severe injury to the fruit if conditions of high temperature, low relative humidity and wind prevail during or after their application. A miscible oil combined with lime-sulphur and applied once during late autumn or early winter gives satisfactory control of the mite for about a year and is also effective against light infestations of *S. oleae*. This combination is of value on navel oranges if the mite has not become numerous before November, as it does not render the fruit susceptible to water-rot.

The use of a spray of 2 per cent. lime-sulphur with the addition of 3–5 lb. wettable sulphur [per 100 U.S. gals.], which gives effective control for about six weeks, may become more general as a combined measure against *P. citri* and the citrus thrips [*Scirtothrips citri*, Moult.] on lemon and navel orange. The addition of wettable sulphur is advisable where lime-sulphur is to be used, and ordinary 325-mesh dusting sulphur rendered wettable with sodium or calcium caseinate or blood albumen is cheaper for this purpose than commercial preparations. Combinations of lime-sulphur with various sulphates gave unsatisfactory results. In tests begun in 1933, the control given by 1·5 per cent. lime-sulphur was improved by the addition of iron [ferrous] sulphate at the rate of 1½ lb. per 100 U.S. gals., but the risk of injury to the fruit at high temperatures was also increased.

Ammonium polysulphide proved less effective as a spray in commercial trials during 1937 than it had done under experimental conditions, where it gave better results than lime-sulphur and was safer at high temperatures. Satisfactory control for 2–3 months may be expected from this material, the effectiveness of which is improved by the addition of 0·33 per cent. light-medium oil. Extensive tests with sulphur dusts gave generally unpromising results, but indicated that with favourable temperatures, economic control is sometimes obtained by repeated applications of sulphur dust, if these are begun when the mite population is low; this measure is more often successful in the extreme south-west of the state than elsewhere.

Promising results against the mite were given by sprays and dusts containing dinitro-ortho-cyclo-hexylphenol [*cf.* **24** 433; **27** 261]. Dusting is quicker and more economical, but as this substance is not very volatile at orchard temperatures it was necessary to devise a dusting equipment that would ensure adequate coverage. Complete mortality is given of all the mites that come in contact with the dust, and progeny that hatch within 3–4 days of the application are killed by the residue. Two applications, the second 10 days after the first, give adequate control for about 6 months, and this material may also be made effective against *A. spiraecola* by the incorporation of sulphur dust.

MUESEBECK (C. F. W.). **A new Species of *Heterospilus* parasitic on an injurious Anobiid (Hymenoptera : Braconidae).**—*Proc. ent. Soc. Wash.* **41** no. 2 pp. 62–63. Washington, D.C., 1939.

The Braconid, *Heterospilus anobiidivorus*, sp. n., is described from two females reared from the Anobiid, *Neogastrallus librinocens*, Fisher [*R.A.E.*, A **26** 329] in Florida.

MCDANIEL (E. I.). **Suggestions for the Control of Sawflies on Conifers.**—*Quart. Bull. Mich. agric. Exp. Sta.* **21** no. 3 pp. 161–164, 2 figs. East Lansing, Mich., 1939.

Notes are given on the appearance and habits of the larvae and adults of sawflies, of which the most destructive to conifers in Michigan in 1938 were *Pristiphora* (*Lygaeonematus*) *erichsoni*, Htg., which is practically restricted to larch, *Diprion* (*Neodiprion*) *pinetum*, Norton, the predominating species on white pine [*Pinus strobus*] in the southern third of the State, *D.* (*N.*) *lecontei*, Fitch, which is common in the northern two-thirds of the State on five species of pine, principally red pine [*P. resinosa*] and jack pine [*P. banksiana*], and *D. similis*, Htg., on Scots pine [*P. sylvestris*].

Where a large area is involved, an arsenical spray is the most satisfactory method of control. One consisting of 3 lb. lead arsenate, 1 U.S. qt. summer oil and 100 U.S. gals. water is recommended. Where only a few trees are involved, a dust is preferable. Three gave satisfactory results in tests; of these, cryolite undiluted or mixed with talc (1 : 3), and calcium arsenate and hydrated lime (1 : 10) gave complete control, no scorching being caused by the cryolite, and a dust containing 0·075 per cent. rotenone, though it acted slowly, killed a number of the larvae and will probably be useful where infestation occurs near vegetables. Larvae may be knocked from the trees, which should then be banded to prevent re-establishment.

List of Intercepted Plant Pests, 1937.—*S.R.A., B.E.P.Q.* [1937] 55 pp. Washington, D.C., U.S. Dep. Agric., 1939.

This list of pests recorded from 1st July 1936 to 30th June 1937 as intercepted with plants and plant products entering United States territory includes pests on products that were imported, offered for but refused entry, held as ships' stores and hence not imported through customs, or offered for entry for immediate export or for immediate transportation and exportation in bond, as well as those in domestic shipments reaching the mainland from Hawaii and Porto Rico. The notes on the insects intercepted are divided into two sections dealing, respectively, with fruit-flies and insects other than fruit-flies, and a special section is devoted to interceptions in aircraft, among which were 1,799 interceptions of insects representing 325 genera. A summary of the interceptions arranged by continents is given. The main part of the report consists in a list arranged by country of origin of the pests intercepted, showing the food-plants or materials on which they were taken, the numbers of interceptions and the States in which the collections were made. Common and incompletely determined pests, which are omitted from this list owing to lack of space, are summarised in short paragraphs under the headings Common Pests Intercepted and Incompletely Determined Pests, respectively.

Sorenson (C. J.). *Lygus hesperus* **Knight and** *Lygus elisus* **Van Duzee in Relation to Alfalfa Seed Production.**—*Bull. Utah agric. Expt. Sta.* no. 284, 61 pp., 14 figs., 21 refs. Logan, Utah, 1939.

Investigations were begun in Utah in 1931 on the degree to which infestation of lucerne by *Lygus hesperus*, Knight, and *L. elisus*, Van D., contributed to the reduction there in the yield of seed (81·25 per cent. in the period 1925–30). These Capsids were the most numerous insects, except thrips, on flowering lucerne, and were taken from farm lands in all counties of the State, including many desert and mountainous areas, and from many cultivated and wild plants, lists of which are given, and grassland. They were more abundant on lucerne than on any other crop, and remained on it until autumn frosts killed the succulent growth, when the adults overwintered in the lucerne fields, in the crowns of the plants or under weeds, grass or débris, or migrated to nearby weeds. The overwintering population in lucerne fields was 30 per cent. of that present in July, when about 7 individuals per sq. ft. were found in moderately infested fields. The number of nymphs declined rapidly as the temperature fell. In investigations on survival during the cold winter of 1930-31, less than 5 per cent. of the adults overwintering in field cages emerged in spring, mostly from 6th to 26th April, but in the field, 16·73 per cent. survived. No nymphs overwintered.

The results of surveys of the field population, the seasonal distribution of nymphs and adults and their relative abundance in lucerne of the first, second and third crops are given in tables. It was found that the numbers were less when the first crop was cut for hay and the second left for seed than when the first growth was left to seed, possibly because eggs and nymphs were destroyed in the cutting. The nymphs were more destructive than the adults. The latter fly and possibly migrate at night, and probably feed more then than in

the daytime. They were caught at light, chiefly on warm cloudy nights in July and August ; none was taken during April or after the middle of September.

All stages of *L. hesperus* and *L. elisus* are briefly described. The overwintered adults paired soon after emergence, and the earliest date at which eggs were observed in the field was 17th April, in 1932. The latest date on which they were laid in cages was 25th September, in 1933. The greatest numbers of eggs were deposited in the terminal three inches of the stems, but some occurred in leaves, particularly in mid-ribs and petioles, in the stems of racemes and in buds. None was found in hard or woody stems. The eggs were usually deposited singly, but sometimes occurred in groups, in which case they split the plant tissue. The durations of the egg stage and of the five nymphal instars in different months in 1931–33 are given in tables, with the corresponding temperatures, rainfall and relative humidities. Since the life-cycle lasts 46 days, there are probably 3–5 generations a year in different parts of the State.

The effects of infestation of buds and flowers by *L. hesperus* and *L. elisus* were investigated in 1931. The percentage losses of pods and seeds after 24 hours' exposure of buds and flowers to varying numbers of bugs, and the percentages of flowers falling after exposures of 1 and 10 days are tabulated. Buds exposed to infestation for 5 days died 2–10 days later. Data on the occurrence of shrivelled seed has already been noticed [*R.A.E.*, A **24** 542]. The reduction in length and thickness of the stems and in the production of normal buds, flowers, seed-pods and racemes increased with the intensity of infestation.

In experiments in 1933, 1937 and 1938, commercial control of the bugs was not obtained by dusting with sulphur, alone or mixed with Paris green or pyrethrum, nicotine sulphate, gypsum and pyrethrum, calcium cyanide or a thiocyanate (Lethane). Cultural methods of control include the removal of crop litter and weeds before winter, the uniform use of either first or second-growth lucerne for seed production in each district, and dragging the fields, unless they are infected with bacterial wilt, soon after the removal of the hay. Few natural enemies were observed. *Nabis ferus*, L., was predacious on first- and second-instar nymphs, and 17 of 36 eggs examined in September 1933 contained pupae of an unidentified Mymarid.

GOBEIL (A. R.). **Les insectes forestiers du Québec en 1938.**—*Bull. Serv. Ent. Minist. Terres Québec* no. 3, 48 pp., 6 figs., 1 fldg. map, 1 ref. Quebec, 1939.

A system was established in Quebec in 1938 whereby annual surveys are to be made of the insect pests of forests. Assistants selected from the fire-rangers collect two samples per month during June, July and August from individual trees in different parts of their districts, and dispatch them to headquarters, with reports of the conditions in which they were found. At present, chief consideration is given to the pests of spruce [*Picea* spp.], but eventually those on all commercial and ornamental trees are to be included.

The results of the survey in 1938 are tabulated to show the total numbers of the species collected, with the plants on which they were found and indications as to whether these were food-plants, and the

numbers of each of the more important species and their distribution in the various counties.

Diprion polytomum, Htg., which comprised 67 per cent. of all the insects collected and is the most numerous and most destructive of the pests of spruce, has now been found over almost all the Province. In 1938, several foci of infestation were reported in the valleys of the Gatineau and Lièvre rivers, which were not known to be infested in 1937. *Pikonema alaskensis*, Rohw. [*R.A.E.*, A **26** 293] appears to be widely distributed, males and females appearing in equal numbers, but is nowhere very numerous. No differences in number or sex were observed between the progeny of fertilised and unfertilised females. It is generally controlled by parasites, but under favourable conditions it may be as destructive as *D. polytomum*; it has been reared experimentally on red spruce [*P. rubra*] as well as on white [*P. glauca*]. In Quebec, the larvae are able to feed on old foliage, and in one district defoliated several white spruces 5–6 ft. high in one year. *Pikonema dimmocki*, Cress., *Peronea variana*, Fern., and *Diprion* (*Neodiprion*) *abietis*, Harr., are also common on spruce. The last apparently has two generations a year in some districts, as many of the larvae received in the samples gave rise to adults in July and August.

Ellopia fiscellaria, Gn., nowhere reached outbreak proportions. Of the specimens of this Geometrid received, 50 per cent. came from Rimouski county and 25 per cent. from the Gatineau valley. Isolated specimens of *Hemerocampa leucostigma*, S. & A., were received from Rimouski and the Matapedia valley.

The most serious pest of larch was *Pristiphora* (*Nematus*) *erichsoni*, Htg., infestation by which appeared likely to cause the death of a considerable number of trees, particularly in the district of Abitibi. Cocoons of this sawfly parasitised by *Mesoleius tenthredinis*, Morl. [**24** 245] were collected in Rimouski, and the parasites were bred out and liberated on severely infested trees. In one district, *Pissodes strobi*, Peck, was abundant on young trees, and severely attacked Norway spruce [*Picea abies*]. Red and black spruce [*P. rubra* and *P. mariana*] were not affected, but white spruce and white pine [*Pinus strobus*] suffered some injury.

Other pests observed in various parts of the Province were *Diprion* (*Neodiprion*) *lecontei*, Fitch, and *D.* (*N.*) *pinetum*, Norton, on pine, and *Marlattia laricis*, Marl., which was sometimes associated with *P. erichsoni*, on larch.

Wolcott (G. N.). **Comején y polilla.** [*Eutermes costalis* and *Calotermes brevis*.]—*Bol. Estac. exp. agric. Rio Piedras, P.R.* no. 48, 26 pp., 13 figs. San Juan, P.R., 1939. (With a Summary in English.)

Three species of termites are of economic importance in Porto Rico, *Eutermes* (*Nasutitermes*) *costalis*, Hlmgr., *Calotermes* (*Cryptotermes*) *brevis*, Wlk., and *Heterotermes tenuis*, Hag.

E. costalis constructs nests from 1½ to 2 ft. in diameter on wooden posts or trees, or in wooden houses and sometimes on the ground. Tunnels radiate to the soil, from which water is obtained, and to places where food is available. Wood is the chief food and flamboyant [*Poinciana*] the preferred food-plant, though avocado and mango are very acceptable and few trees common in Porto Rico are exempt from attack. The nest and the social organisation of the colony are

described. The colony may be destroyed by cutting up the nest, so as to expose the termites to attack by birds, or the termites may be killed by placing a tablespoonful of Paris green or white arsenic on the top of the nest or in the main tunnels.

Calotermes brevis is more destructive because it lives within dry wood and constructs no external tunnels. Even in concrete houses it attacks wooden parts, furniture, etc., until only a thin shell remains. Woods vary very greatly in resistance to attack. The heartwood of mahogany, lignum vitae [*Guaiacum*], West Indian satinwood [*Zanthoxylum*], mangrove [*Rhizophora*] and a native wood called "cóbana negra" [*Stahlia*] are practically immune. The varying degrees of susceptibility of other woods are briefly discussed. When dispersion flights occur, it is possible by keeping the house in darkness and illuminating only the porch to entice most of the adults out of the house, or prevent them from entering.

Heterotermes tenuis, which is comparatively rare, nests in the ground and usually feeds on wood and tree roots. It also occasionally attacks wood in houses, to reach which it constructs narrow earthen tunnels over or through concrete foundations. Metal shields should be placed between the wood and the concrete [*cf. R.A.E.*, A **17** 730, etc.], to prevent the construction of tunnels. If *H. tenuis* is abundant in the ground, the only really satisfactory measure is to rebuild in concrete.

SAALAS (U.). *Stromatium barbatum* **Fabr. toukan (Col., Cerambycidae) kulkeutuminen Intiasta Suomeen vanerilaudan kappaleessa.** [A Larva of *S. barbatum* in a Piece of Plywood in Finland from India.]—*Ann. ent. fenn.* **5** no. 1 pp. 41–47, 2 figs. Helsinki, 1939. (With a Summary in German.)

Several tea-chests, made in India from birch plywood exported from Finland, were found on their arrival in London in March 1936 to be injured and to be infested with large larvae. From a sample of the infested plywood sent to Finland the author bred out, in October 1938, *Stromatium barbatum*, F., a Cerambycid that occurs only in the region of the Indian Ocean [*cf. R.A.E.*, A **25** 647]. Injury in 1934 to Finnish plywood similarly imported into India had been caused by a south Asiatic Buprestid, of the genus *Chrysochroa* (*Catoxantha*).

SPOON (W.). **Derris tegen thrips in vlas.** [Derris against Thrips on Flax.]—*Tijdschr. PlZiekt.* **45** pt. 2 pp. 75–79, refs. Wageningen, 1939; also as *Ber. Afd. Handelsmus. Kolon. Inst.* no. 134, 1939 (with a Summary in English); and in *Ind. Mercuur* **62** no. 8 p. 95, 1939.

This is a report of work on the control of *Thrips lini*, Lad., on flax (*Linum usitatissimum*) in Holland and the successful use of derris against it by A. Ovinge [*R.A.E.*, A **27** 233–34].

STELLWAAG (F.) & others. **Institut für Pflanzenkrankheiten.** [Report for 1937 of the Institute for Plant Diseases at Geisenheim a. Rhein.]—*Wiss. Jber. VersForsch.-Anst. Wein-, Obst- u. Gartenb. Geisenheim a. Rh.* 1937, pp. 18–24. Geisenheim a. Rh., 1938.

The work done at Geisenheim during 1937 included experiments on the control of the vine moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] by means of baits [*R.A.E.*, A **26** 154] and on

the choice of winter refuges for pupation by *C. ambiguella* [**26** 419]. Investigations showed that males were attracted to adhesive traps containing unpaired females of the same species from a distance of at least 21 yards and probably much more. White surfaces were more attractive than black ones. The prevalent view as to the ecological valency of the two moths was shown to be incorrect. *C. ambiguella* prefers warmth and moisture, not cold, and *P. botrana* requires not warmth alone, but warmth and dryness [*cf.* **26** 661].

Mühle (E.). **Ein Laufkäfer als Erdbeerschädling.** [A Carabid Pest of Strawberry.]—*Kranke Pflanze* **16** pt. 4 pp. 67–69. Dresden, 1939.

Notes are given on the bionomics of the Carabid, *Harpalus rufipes*, DeG. (*Ophonus pubescens*, Müll.), which occasionally causes serious damage to the fruits of strawberry in Germany by feeding on the seeds. In one district in Saxony, it caused a crop loss of 80 per cent. Baits of milk, meat, sugar solution or over-ripe strawberries are the best means of control; they should be exposed in pots with smooth vertical sides sunk level with the surface of the ground [*cf. R.A.E.*, A **27** 457].

Nolte (H. W.). **Unterschiede der Raupen von Nonne und Flechtenspinner sowie der Falter von Nonne und Mönch.** [Differences between the Larvae of *Lymantria monacha* and *Eilema depressa* and between the Adults of *L. monacha* and *Panthea coenobita*.]—*Tharandt. forstl. Jb.* **90** pt. 2 pp. 157–163, 5 figs. Berlin, 1939.

For the guidance of foresters in Germany, morphological characters distinguishing the larvae of *Lymantria monacha*, L., and *Eilema depressa*, Esp. (*Lithosia deplana*, Esp.), and the adults of *L. monacha* and *Panthea coenobita*, Esp., are described.

Fischer (H.). **Untersuchungen über das Durchdringungsvermögen von Blausäure bei Packmaterial für Baumschulpflanzen.** [Investigations on the penetrative Capacity of Hydrocyanic Acid Gas in Packing Material for Nursery Stock.]—*NachrBl. dtsch. PflSch-Dienst* **19** no. 3–4 pp. 19–20, 32–33, 8 refs. Berlin, 1939.

Nursery stock to be exported from Germany is sometimes fumigated with hydrocyanic acid gas, to comply with the import regulations of other countries. Such plants are usually packed for transport in a layer of straw or reeds wrapped round them by machinery and tied by wire, and the experiments described were undertaken to investigate whether the hydrocyanic acid gas can penetrate this packing and kill any insects that may be present on the plants. Both straw and reeds have been shown to absorb HCN. Dry straw absorbs about 93 mg. HCN. per 100 gm., and damp straw over 100 mg., and only after saturation has been reached can further amounts of gas penetrate. The plants are usually fumigated for 2 hours, but in the tests this time was shown to be insufficient to permit satisfactory penetration and consequent insect mortality. As any increase in the duration of fumigation would be attended by risk to the plants, which are not all packed equally tightly, it is recommended that the packing should be removed, or at least loosened, before fumigation.

Beran (F.). **Die Wirkungsweise von Obstbaumkarbolineumemulsionen mit besonderer Berücksichtigung der Anwendungstemperatur.** [The Mode of Action of Fruit-Tree Carbolineum Emulsions with special regard to the Temperature at the Time of Application.]—*NachrBl. dtsch. PflSchDienst* **19** no. 4 pp. 25–29. Berlin, 1939.

Although the tar distillates known as fruit tree carbolineums [*cf. R.A.E.*, A **18** 183; **24** 797] have been successfully used in insect control for many years and have even been adopted as standards of comparison in testing other insecticides, little is known of their mode of action on the insect organism. Since their toxicity increases with a rise in the boiling point of the tar oils, it has been considered that their action is mainly physical, mortality resulting from asphyxiation by the film of oil, but since tar oils are more effective than mineral oils against the eggs of Aphids and Psyllids, some chemical factor must also be involved. American workers have shown that the effectiveness of mineral oils depends partly on their ability to penetrate the tracheae [**24** 779], and in the case of certain Coccids, to dissolve the waxy covering. It has been shown by Miestinger that the differences in effectiveness against *Epidiaspis leperii*, Sign., of similar tar-distillate emulsions used over a considerable period of time are correlated with variations in temperature, and a table is given showing the results obtained by him with various medium and heavy tar-oil emulsions applied at various dates. The investigations described in the present paper were carried out to elucidate this dependence on temperature.

In preliminary experiments to verify the occurrence of differences in toxicity at different temperatures independently of the physiological condition of the test insects, last-instar larvae of *Tenebrio molitor*, L., were dipped in batches of 5 for 1 or 2 minutes into 10, 15 and 20 per cent. proprietary heavy tar-oil emulsions and 20 and 25 per cent. medium oil emulsions at temperatures of 0, 12 and 22°C.[32, 53·6 and 71·6°F.] and were then kept for 14 days at about 15°C. [59°F.]. The results showed that the percentage mortality increased with the temperature, this increase being the more pronounced in the case of the heavy oil emulsions.

Field experiments were then made, in which currant bushes heavily infested with *Aspidiotus perniciosus*, Comst., were sprayed on 1st December 1937 at 9°C. [48·2°F.], on 7th December at 2°C. [35·6°F.], this temperature falling to 1°C. [33·8°F.] during the experiment and then to nearly freezing point, and on 7th March 1938 at 11·5°C. [52·7°F.] with various concentrations of heavy and medium oil carbolineums and with combinations of both types. The percentage mortalities given at 1–2, 9 and 11°C. by 7·5 and 10 per cent. medium oil emulsions were 79·7, 86·7 and about 98·3, and 93·7, 100 and 100, and by 5 and 7·5 per cent. heavy oil emulsions, 83·8, 96·7 and 94, and 86·7, 100 and 99·5, respectively. The various combinations of the two types of oils gave similar results. It is concluded that these variations are due to temperature, and that there is no marked difference in the influence of temperature on medium oil and heavy oil carbolineums in the field.

To test the ability of tar-oil and mineral-oil emulsions to dissolve the wax coating of *A. perniciosus*, the scales from a number of adults were washed with distilled water, thoroughly dried, and weighed before and after being shaken up with 10 per cent. emulsions. A heavy oil carbolineum reduced their weight by 12·8 per cent., but a mineral-oil

emulsion did so by 17·2 per cent. At the low temperature of 2°C., the latter still reduced it by 6·97 per cent., but the carbolineum did so by only 0·6 per cent.

The practical conclusion drawn by the author is that carbolineums, like mineral-oil emulsions, should be applied at as high a temperature as possible, and never near freezing point, if the maximum mortality is to be obtained and economy in the products to be achieved.

Straňák (F.) & Blattný (C.). **Důležití a významní škodliví činitelé kulturních rostlin v Čechách ve vegetační sezoně 1937–1938.** [Important adverse Factors affecting cultivated Plants in Bohemia during the Vegetation Period 1937–38.]—*Ochr. Rost.* **15** pp. 3–11. Prague, 1939. (With a Summary in German.)

Baudyš (E.). **Zpráva o škodlivých činitelích v hospodářském roce 1937–1938 v zemi Moravskoslezské.** [Report on adverse Factors in the agricultural Year 1937–38 in the Area of Moravia-Silesia.]—*T.c.* pp. 12–19, 1 fig. (With a Summary in German.)

Vielwerth (V.). **Choroby a škodci kultúrnych rastlin západného a stredného Slovenska za hospodársky rok 1937–1938.** [Diseases and Pests of cultivated Plants in western and central Slovakia in the agricultural Year 1937–38.]—*T.c.* pp. 19–23. (With a Summary in German.)

Fiala (F.). **Zpráva o škodlivých činitel'och kultúrnych rastlín na východ. Slovensku a Podk. Rusi v hospodárskom r. 1937–38.** [Report on adverse Factors affecting cultivated Plants in eastern Slovakia and in Carpathian Ruthenia in the agricultural Year 1937–38.]—*T.c.* pp. 23–26. (With a Summary in German.)

Notes are given on the occurrence in 1937–38 of various diseases and pests, chiefly insects, of cultivated plants in different parts of Czechoslovakia. They are arranged under the crops attacked and are mostly recorded under their popular names, with brief notes on their local distribution and abundance. Species that caused damage in several areas were *Ceuthorrhynchus macula-alba*, Hbst., on poppies; *Aphis papaveris*, F., on sugar and fodder beet; *Aporia crataegi*, L., and *Cydia pomonella*, L., on apples; and *Aspidiotus ostreaeformis*, Curt., on apples and plums, and in some districts also on gooseberries and currants.

Of the pests that were prevalent in Bohemia, the most important were *Psila rosae*, F., on carrot; *Contarinia nasturtii*, Kieffer (*Dasyneura torquens*, de Meij.) on cauliflower; *Spilonota ocellana*, F., on apples; *Coleophora hemerobiella*, Scop., sawflies of the genus *Hoplocampa*, and a species of *Lecanium* on plums; and the larvae of *Lymantria dispar*, L., and *Nygmia phaeorrhoea*, Dön., on fruit trees in low-lying districts.

Pests observed in Moravia and Silesia included *Zabrus tenebrioides*, Goeze, on rye; *Oscinella* spp. and *Anisoplia austriaca*, Hbst., on wheat; *Haplodiplosis* (*Clinodiplosis*) *equestris*, Wagn., and *Chlorops taeniopus*, Mg., on spring-sown barley; *Myzus persicae*, Sulz., on peach; *C. hemerobiella* on apples; and *Malacosoma neustria*, L., and *Nygmia phaeorrhoea*, Dön. (*Euproctis chrysorrhoea*, auct.) on oaks.

The more injurious species in western and central Slovakia were *Cephus pygmaeus*, L., on wheat; *Bruchus pisorum*, L., on peas; *Epicometis hirta*, Poda (*hirtella*, L.) on flowers of rape; and *Stephanitis pyri*, F., and *N. phaeorrhoea* on fruit trees.

In eastern Slovakia and Carpathian Ruthenia, barley was attacked by *Lygus pratensis*, L., and *Gryllotalpa gryllotalpa*, L.; thrips were abundant on rye; wireworms caused much damage to seedling sugar beet; potatoes were attacked by the larvae of *Agrotis segetum*, Schiff., and *Melolontha*; *Anthonomus pomorum*, L., infested apples; leaf Aphids, mites and the larvae of *Zeuzera pyrina*, L., attacked fruit trees; and *Melolontha* was abundant in orchards and forests in mountainous districts.

Kalandra (A.) & Pfeffer (A.). **Důležitější a pozoruhodnější poškození, choroby a škůdci lesních dřevin v r. 1937–1938 v Československu, včetně území soused. státům odstoupených.** [The more important Injuries, Diseases and Pests of Forest Trees in the Years 1937–38 in Czechoslovakia, including Territories ceded to neighbouring States.]—*Ochr. Rost.* **15** pp. 26–33. Prague, 1939. (With a Summary in German.)

The warm dry weather that prevailed in Czechoslovakia in 1937 was very favourable to the development of various insect pests of forests, but their increase was checked by the cold damp spring of 1938. In the second part of this paper, A Pfeffer gives brief notes on their prevalence and local distribution. Spruce (*Picea abies*) was again severely attacked in many districts by *Lymantria* (*Liparis*) *monacha*, L., and the sawflies, *Pristiphora* (*Nematus*) *abietina*, Christ, and *Pachynematus* (*N.*) *montanus*, Zaddach [*cf. R.A.E.*, A **26** 657]. Pines (*Pinus sylvestris*) were chiefly infested by *Rhyacionia* (*Evetria*) *buoliana*, Schiff., *R.* (*E.*) *turionana*, Hb., and the Geometrid, *Bupalus piniarius*, L. Considerable damage to *P. mugo* was caused by the larvae of the sawfly, *Diprion sertifer*, Geoffr. (*Lophyrus rufus*, Retz.). In addition to the Aphid, *Chermes nordmannianae*, Eckstein (*Dreyfusia nüsslini*, Börner), which was abundant in a number of districts, considerable infestation of *Abies alba* by *Tortrix* (*Cacoecia*) *murinana*, Hb., occurred in two localities. Larch (*Larix decidua*) was attacked by *Chermes viridis*, Ratz., and *C.* (*Cnaphalodes*) *strobilobius*, Kalt., and by the larvae of the sawfly, *Pristiphora* (*Nematus*) *laricis*, Htg. The Coccid, *Diaspis visci*, Schr., infested *Juniperus communis* and other ornamental conifers, and the larvae of *Malacosoma neustria*, L., and *Nygmia phaeorrhoea*, Dön. (*Liparis chrysorrhoea*, auct.) attacked oaks. *Lyctus linearis*, Goeze (*canaliculatus*, F.) caused some damage to parquet floors in Prague, and *Hylotrupes bajulus*, L., was recorded from wooden poles.

Blattný (C.). **Příspěvky k boji proti některým polním škůdcům.** [Contributions to the Control of certain Field Pests.]—*Ochr. Rost.* **15** pp. 43–51. Prague, 1939. (With a Summary in German.)

The weevil, *Ceuthorrhynchus macula-alba*, Hbst., is a serious pest of poppy in Slovakia and southern Moravia, where it is favoured by a dry climate and mild winter. Its bionomics there are similar to those recorded from Hungary and Russia [*cf. R.A.E.*, A **24** 402, 704]. In 1938, the overwintered adults appeared in the first half of March, but re-entered the soil in April owing to cold weather. Emergence started again early in May, and the weevils reached maximum abundance and paired when the poppies were in full flower. At

temperatures of 18°C. [64·4°F.] and over, they flew for distances of up to 6½ ft. and were also carried by the wind. Females deposited about 150 eggs, up to 8 being observed in a single seed capsule. As many as 28 weevils were collected from one capsule. Oviposition continued throughout the flowering period and until the capsules became hard. Young weevils were observed in their cells in the soil in September at a depth of 14 ins. About 1 per cent. of the old weevils hibernated as well. In the spring, the adults injured the plants before blossoming by gnawing the stems just below the buds. Collecting the weevils in May and June from trap strips of poppy sown early in the spring along the edges of last year's fields, or across them, greatly reduces the infestation of the current crop. When this measure was adopted in a locality in Slovenia in 1938, only about 9 per cent of the capsules were infested, as compared with 80 per cent. in the previous year, and the seeds obtained were of a much better quality. Late sowing or cultivation of different varieties gave no protection against infestation.

In Czechoslovakia, infestation of beet by *Cleonus* (*Bothynoderes*) *punctiventris*, Germ., increased in the period 1925–34, and control measures on a large scale were carried out against it on the State beet-growing farms in 1934–36. The measures adopted included digging ditches round the plantations to trap the weevils; sowing trap strips of beet along the edges of the fields that had been under beet in the preceding year; dusting or spraying the young plants with insecticides; and injecting into the soil a preparation of crushed weevils overgrown with fungi to infect the hibernating adults. Turkeys, crows and sea-gulls destroyed large numbers of weevils; the sea-gulls were attracted by offering them baits of raw meat. Dusting or spraying with calcium arsenate proved of greater value than spraying with barium chloride, as the latter has to be used at high concentrations that scorch young plants; if it is applied at low concentrations, the weevils die only after eating a large amount of foliage, so that damage is still caused to the beet. Weevils two years old were collected in the spring of 1935 in trap ditches dug in the spring of 1934; as that year was very hot and dry, some of the weevils were unable to penetrate the hard crust that formed on the surface and remained in the soil till the following year.

In field experiments in Bohemia, sweeping red clover [*Trifolium pratense*] with an oval net measuring 36×20 ins. and mounted on a pole proved an effective method of capturing adults of *Apion apricans*, Hbst. Fields were swept at intervals of 7–10 days from the beginning of the formation of the heads to the beginning of flowering, the best time being 2–3 hours before sunset. A strip about 10 ft. wide was swept at a time; 24 thousand weevils per acre were collected in the first sweeping, and in the three following ones 12, 6 and 2 thousand, respectively.

Krátké zprávy. [Short Notes.]—*Ochr. Rost.* **15** pp. 51–56, 1 fig. Prague, 1939. (With Summaries in German.)

These notes by various workers include a statement by Tiburec and Blattny (p. 54) that the addition of chloropicrin to insecticidal dusts often increases their effectiveness. Thus, dusting with nicotine sulphate alone only stunned the poppy weevil, *Ceuthorrhynchus maculaalba*, Hbst., whereas complete mortality was obtained when 3 cc.

chloropicrin was added per 1,000 gm. dust. In experiments with the greenhouse whitefly, *Trialeurodes vaporariorum*, Westw., all the adults were dead 30–38 minutes after being dusted with a powder of derris and pyrethrum mixed with chloropicrin at the same rate. In tests with *Aphis gossypii*, Glov., however, a dust of derris and chloropicrin proved just as ineffective as one of derris alone. This and the fact that the whiteflies became very active before they died indicate that chloropicrin itself does not possess any particular insecticidal property, but, by accelerating the metabolic processes in the insects, renders them more susceptible to the toxic effects of other substances.

KAC [—]. **O tohoročnom " chrústovom roku " v západnom a strednom Slovensku.** [The current " Cockchafer Year " in western and central Slovakia.]—*Ochr. Rost.* **15** pp. 55–56. Prague, 1939.

Since in western and central Slovakia cockchafers [*Melolontha*] complete their life-cycle in four years, a mass appearance of the adults was expected in 1938. Owing, however, to spells of unusually cold, rainy and windy weather in spring, their emergence and flight occurred in three distinct waves, the first from the end of April to 4th May, the second from the middle to 25th May, and the third at the beginning of June. As a result, damage by cockchafers was less than usual, and owing to retarded development, their reproductive capacity was reduced. Many of the beetles died, presumably through a fungous disease acquired in the soil.

LOMBARDI (D.). **Osservazioni sulla morfologia e biologia della *Targionia vitis* Sign.** [Observations on the Morphology and Biology of *T. vitis*.]—*Boll. Inst. Ent. Bologna* **10** pp. 117–138, 11 figs., 20 refs. Bologna, 1938.

Descriptions are given of all stages of *Targionia vitis*, Sign. This Coccid is not a serious pest of the grape-vine in Italy, but infestation by it weakens the plants and renders them less able to resist other pests. Observations on its development, an account of which is given, indicate that it has one generation a year. Its chief natural enemies are a fungus and the Aphelinid, *Coccophagoides* (*Diaspiniphagus*) *similis*, Masi. Larvae of a Cecidomyiid and of a Nitidulid of the genus *Cybocephalus* prey on the newly hatched crawlers.

RUFFO (S.). **Studî sui Crisomelidi (Insecta Coleoptera).**—*Boll. Inst. Ent. Bologna* **10** pp. 178–222, 1 fig., 3 pls., many refs. Bologna, 1938.

This paper includes observations made in the region of Verona, North Italy, on the bionomics of the summer generation of *Crioceris asparagi*, L., on asparagus.

The adults appear about mid-July, are very lively, especially in the hot bright period of the day, and feed on the leaves and tips of tender shoots. Pairing and oviposition are described. The eggs are usually deposited in rows of 5–6 on the leaves or shoots. The egg stage lasts about a week in July and August, and the larvae are sluggish and feed on the leaves. They moult to the fourth instar in about 6 days, and then descend into the ground, where they form earthen cells in which they pupate after about 4 days. The pupal stage lasts about

6 days, but the adults remain in the cells for a further 2 or 3 days. The adults that emerge are active until the end of September, but do not oviposit; they hibernate, usually under the bark of trees near the infested asparagus.

Endophagous parasites of the Criocerid were an undetermined Eulophid of the genus *Tetrastichus* and the Tachinid, *Meigenia mutabilis*, Fall. Females of the former oviposited in the host eggs, 4–6 parasites generally emerging from each host, and the percentage of larval parasitism is estimated as 90. Parasitised larvae form their pupal cells, but are unable to pupate. The Eulophid pupates in the cell after about 2 days in summer, and the adults emerge about 9 days later, but after mid-August it overwinters and pupates in the spring. Parasitism by *M. mutabilis* [*cf. R.A.E.*, A **27** 194] was much less important. Only one Tachinid emerged from a host larva, but in one instance the larvae of 1 Tachinid and 13 Eulophids were observed in a single host. The pupal stage lasted 9–12 days.

GOIDANICH (A.). **Il deperimento primaverile del Sorgo zuccherino in Piemonte nei suoi rapporti con gli Insetti e in particolare con gli Afidi.** [The unhealthy Condition in Spring of Sugar Sorghum in Piedmont in Relation to Insects, especially Aphids.]—*Boll. Inst. Ent. Bologna* **10** pp. 281–347, 27 figs., 1 pl., many refs. Bologna, 1938.

The investigations described were carried out in 1938 in Piedmont in view of the unhealthy condition in spring of sugar sorghum (*Sorghum vulgare* var. *saccharatum*), up to 80 per cent. of the plants dying in some districts in that year. This condition, which was shown to be due to the attacks of sucking insects, especially Aphids, is characterised by purplish spots on the leaf-sheaths, and the leaves, which become covered with honeydew, are deformed and wither. Growth is checked, and if the attack continues the plant dies. The Aphids observed in spring disappeared at the end of June, and the plants that had survived the attack recovered and yielded a normal crop. No bacterial infection was observed, but in July a disease appeared, which by reason of its characters and similarity to recognised virus diseases of sugar-cane and maize, is considered to be due to a virus transmitted by sucking insects. Coincident with the spread of this disease, there was an increase in the numbers of *Aphis* (*Rhopalosiphum*) *maidis*, Fitch, an Aphid that had not been observed on the plants in spring. The Aphids present then had been *Toxoptera* (*Rhopalosiphum*) *graminum*, Rond., *Macrosiphum* (*Amphorophora*) *avenae*, F., and *M.* (*A.*) *dirhodum*, Wlk. *Limothrips schmutzi*, Priesner, and *Haplothrips aculeatus*, F., were almost as numerous, while *Lygus pratensis*, L., and *Cicadella viridis*, L., were also observed. The behaviour of these species on sugar sorghum is described, and their possible relation to the virus disease is discussed. *A. maidis* is considered to be the most probable vector.

The parthenogenetic females of the four Aphids are described in detail, and their food-plants and geographical distribution are discussed. *A. maidis* occurs throughout the tropics on Graminaceae, and is a serious pest of cereals. *T. graminum* is slightly less widespread than *A. maidis*, and also develops exclusively on Graminaceae. *M. avenae* and *M. dirhodum* are holarctic species; *Rubus* and *Rosa* are the primary food-plants of the former and *Rosa* also of the latter.

Russo (G.). **VI. Contributo alla conoscenza dei Coleotteri Scolitidi. Fleotribo : *Phloeotribus scarabaeoides* (Bern.) Fauv. Parte seconda (Biografia, simbionti, danni e lotta).** [Sixth Contribution to the Knowledge of the Scolytids. *P. scarabaeoides*, Bern. Part II (Biology, symbionts, injury done and control).]—*Boll. Lab. Ent. agrar. Portici* **2** pp. 1–420, 215 figs., 11 pp. refs. Portici, 1938.

This second part of a monograph on *Phloeotribus scarabaeoides*, Bern. [*cf. R.A.E.*, A **25** 592], which is an important pest of olives in Italy, contains detailed accounts of the bionomics of the Scolytid based on several years' work by the author in various parts of Italy and of the injuries it causes to the trees. Abiotic factors, chiefly climatic, that check its increase are discussed, and descriptions are given of a large number of predators and parasites, some of which are new to science, that attack it, with notes on their bionomics and economic importance. Methods of control by biological and artificial means and by cultural practices are reviewed.

La Ferla (A.). **Contributo alla conoscenza del Cleono del carciofo (*Cleonus piger* Scop.).** [A Contribution to the Knowledge of *C. piger* infesting Artichoke.]—*Boll. Lab. Ent. agrar. Portici* **3** pp. 3–33, 20 figs., 24 refs. Portici, 1939.

All stages are described in detail of *Cleonus piger*, Scop., and an account is given of its bionomics on globe artichoke, *Cynara cardunculus* var. *scolymus*, in the region of Naples. This weevil occurs in many parts of Europe, and a list is given of the food-plants from which it has been recorded. In the author's observations, a few weevils were present on the artichokes at the end of February, but they were most abundant in April and May. They fed on the leaves, but usually caused little damage. Newly emerged adults required 3–7 days for maturation ; pairing occurred from early March, and the oviposition period, which lasted a month, began a few days later, the eggs being laid in cavities excavated by the females at the bases of the leaf-ribs and near the root-collar. The larvae hatched in 13–20 days, the earliest being observed in the first ten days of April ; they enlarged the hollow in which the eggs were deposited, mined the leaf-rib and then made tortuous mines in the roots, sometimes killing the plants. They pupated in chambers in the roots in the last ten days of May, and the adults emerged 12–20 days later. The resulting larvae become full-fed at the end of August and in September, and adults appeared at the end of September or early in October ; late pupae and larvae may also still be present. In fine weather in winter, some adults occurred on the leaves, and some pupae, and, occasionally, mature larvae, were observed in the roots.

As the leaves are used as green forage for cattle, no poison sprays were tested, but a 4 per cent. spray of barium chloride, which is harmless to cattle, might be of use in spring. The control measure advised is hand collection of the adults in spring, together with the destruction of old roots and of infested plants.

Grandi (G.). **Gli insetti e l'economia nazionale.** [Insects and national Economy.]—*Boll. Soc. ent. ital.* **71** no. 2 pp. 34–39. Genoa, 1939.

In this address, the speaker points out that many biological discoveries have resulted from the study of insects. He outlines the

action, harmful or beneficial, of insects in regard to man and gives a brief survey of entomological work in Italy in the past. The need for entomological organisation to deal with problems affecting Italian national economy is stressed.

UVAROV (B. P.). **An American Membracid in Jugoslavia (Hemiptera).** —*Proc. R. ent. Soc. Lond.* (A) **14** pts. 2–3 p. 48. London, 1939.

The capture, in December 1938, of two adults of *Ceresa bubalus*, F., near Belgrade, Jugoslavia, confirms the suggestions that the European distribution of this Membracid [*cf. R.A.E.*, A **19** 178; **26** 343; **27** 169] is wider than has been supposed.

[ARKHANGEL'SKIĬ (P. P.).] **Архангельский (П. П.). Coccids occurring in Orchards and Gardens in Uzbekistan.** [*In Russian.*]—*Social. Sci. Tech.* **6** no. 9–10 pp. 58–64. Tashkent, 1938.

A list is given under their popular and scientific names of 29 species of Coccids that occur in Uzbekistan on fruit trees and shrubs in orchards or on shade trees planted in towns along streets and in public gardens, etc., and the economic importance, food-plants, distribution and prevalence of 18 species that cause the greatest injury are briefly discussed.

Of these the following are the most injurious: *Parlatoria oleae*, Colv., which severely infests the stems, branches and shoots of apple, usually reducing by about 50 per cent. the yield of fruit, and which to a less extent infests pears, walnuts, currants, raspberries and a large number of forest and ornamental trees and bushes; *Chionaspis asiatica*, Arch., which attacks the branches, shoots, leaves and fruits, chiefly of sloe [*Prunus spinosa*], apricot and almond; *Leucodiaspis* (*Leucaspis*) *archangelskyae*, Ldgr., which is abundant on the stems and branches of pears, stunting the development of the fruits and often causing young trees to dry up, and which also attacks cherries, sloes and almonds; *Aspidiotus prunorum*, Laing, which infests cherries, almonds and plums; *Lecanium* (*Sphaerolecanium*) *unifasciatum*, Arch., which in some districts infests an average of 40 per cent. of the peaches and about 59 per cent. of the almonds; *L.* (*S.*) *prunastri*, Boy., which chiefly attacks sloe, plum, peach and apricot; *Phenacoccus aceris*, Sign., which occurs in large numbers on the stems and branches of apple, causing fruit-fall, and also infests pears and plums; and *Aspidiotus slavonicus*, Green, which is the most serious pest of poplars and willows in towns in Uzbekistan, where it causes the death of many thousands of young poplars every year. Other injurious species include *Lecanium rugulosum*, Arch., and *L. coryli* var. *turanicum*, Arch., on quince, apple, pear, sloe, almonds and a number of other trees; *L. corni*, Bch., on white acacia [*Robinia*] and to a less extent on fruit trees; and *Lepidosaphes* (*Coccomytilus*) *zlocistii*, Boden., chiefly on apricot, peach and plum.

[MOROSHKINA (O. S.) & AKIMOVA (A. S.).] **Морошкина (О. С.) и Акимова (А. С.). The Lucerne Leaf-Bug and its Control.** [*In Russian.*]—*Socialist. Grain Fmg* 1938 no. 5 pp. 101–117, 2 graphs, 5 figs., 5 refs. Saratov, 1939.

Examinations in 1937 in several districts in the Province of Rostov of lucerne grown for seed showed that it was infested by 42 species of

insects, of which the most injurious and widely distributed were the Eurytomid, *Bruchophagus gibbus*, Boh., which destroyed the seeds in the pods, and the Capsid, *Adelphocoris lineolatus*, Goeze, which fed chiefly on the young terminal leaves and inflorescences. Field observations on the bionomics of the Capsid showed that it has two overlapping generations a year, hibernation occurring in the egg stage in the stems of lucerne. In the spring, the nymphs appeared from 10th to 15th May and immediately began to feed on the plants on which they hatched. When their food-supply is abundant, they migrate very little, and neighbouring plots of lucerne may thus escape infestation. Adults were observed from the beginning of June and were most numerous about 15th–20th. Eggs were deposited singly or in batches of up to 47 in the stems of lucerne at heights of 9–36 ins. from the surface of the soil. The adults of the summer generation were most numerous between 5th and 10th August and females deposited their eggs in young stems of lucerne at heights of up to 6 ins. from the ground, singly or in batches of up to 17, though in one instance as many as 38 eggs were observed in one batch. Oviposition ceased in September, but adults occurred on lucerne till 15th–20th October.

Special experiments in July with potted plants of lucerne, some of which were artificially infested with bugs from the field during flowering, showed that moderate shedding of inflorescences takes place on uninfested plants, the percentage of fallen buds increasing from 3·67 to 37·57 as the humidity of the soil decreased from 73·6 to 27·6 per cent. of its total moisture capacity. In the case of infested plants, however, the corresponding figures were 97·48 and 100, which indicates that the infestation by the bug is the chief cause of shedding.

In experiments, which are described in detail, on the possibility of controlling *A. lineolatus* by burning lucerne stubble about the end of March, all the hibernating eggs were destroyed when complete burning was ensured by covering the plot with a layer of straw 4 ins. thick. In similar tests in late autumn, 95·13 per cent. of the eggs were killed when the stubble was burnt by means of straw applied at the rate of 8 cwt. per acre. With smaller quantities of straw, burning was irregular, large patches were left unburnt, and about 83 per cent. of the eggs survived. In plots in which 8 cwt. of straw per acre had been burnt, the lucerne plants flowered early and simultaneously and the yield of seed was good, whereas in those in which smaller quantities of straw had been used, flowering was protracted and sparse and, owing to the infestation by the bug, the yield of seed was very low. Hardly any plants flowered in untreated plots. It is important that the snow should be left on plots that have been burnt over in the autumn, as otherwise the lucerne may freeze. Cutting lucerne in mid-October to about 2 ins. from the ground and then collecting and burning the débris removed 81·9 per cent. of the eggs of the bug.

Comptes Rendus de la V^e^ Conférence Internationale pour les Recherches Antiacridiennes.—Roy. 8vo, 445+87+19 pp., 5 pls., 13 maps, 1 fldg. table, text ill. Brussels, Minist. Colon., 1938.

The following are summaries of the papers read at this conference and of the resolutions associated with them.

Uvarov (B. P.) & Bowman (B. M.). The economic importance of the locust and grasshopper problem throughout the world (pp. 190–236,

40 tables). Following the recommendations of the Fourth Conference [*R.A.E.*, A **26** 677], statistical data on damage caused by locusts and on expenditure on their control during the period 1925–34 were collected at the International Centre for Anti-Locust Research, which sent out a special questionnaire to all countries subject to locust invasions (appended). Replies were received from 41 countries; in addition, published data were available for another 8. All this information is tabulated for each country, and the totals for each item are summarised for all the countries together. During the 10-year period in question, the losses to crops amounted to over £83,000,000. The total expenditure on control was about £13,000,000 and in addition, 9,000,000 working days were annually involved.

In Resolution 1 (pp. 50–54), attention is drawn to the great economic importance of locusts and grasshoppers, as revealed by the summary, and the preparation of similar statistical returns every year, for communication to the International Centre, is recommended.

Del Carril (L. M.). Rapport sur la situation acridienne et l'organisation antiacridienne en Argentine (pp. 85–96, 4 maps, 1 fig.). In Argentina, the two species of greatest economic importance are *Schistocerca paranensis*, Burm., and *Trigonophymus arrogans*, Stål; *Scyllina picta*, Brun., sometimes mixes in large numbers with swarms of *S. paranensis*. Practically the whole of Argentina is liable to invasions by locusts. The organisation of locust research and control is briefly described; 10,000,000 pesos are annually provided for control, which is carried out by means of poisoned baits against *T. arrogans* and of metal barriers against the hoppers of *S. paranensis*. The results of recent field and laboratory investigations have been summarised elsewhere [**25** 114; **26** 146; **27** 213].

Nicholson (A. J.). The grasshopper problem in Australia (pp. 97–99). The organisation of the basic anti-locust research [*cf.* **26** 583–584], information service and control in Australia is outlined. *Chortoicetes terminifera*, Wlk., can be successfully controlled by poison baits prepared by mixing 96 lb. bran with 2 lb. sodium arsenite, 16 lb. molasses and 10 gals. water.

Brédo (H. J.). Rapport sur la situation acridienne et l'organisation antiacridienne au Congo Belge (pp. 100–102, 2 maps). *Locusta migratoria migratorioides*, R. & F., and *Nomadacris septemfasciata*, Serv., are the two most important species in the Belgian Congo, although swarms of *Schistocerca gregaria*, Forsk. [**21** 155] and smaller assemblies of *Homorocoryphus vicinus*, Wlk., and *Phymateus viridipes*, Stål, have also been recorded. Maps illustrating the areas invaded by *L. m. migratorioides* and *N. septemfasciata* in 1930–36 are included; it is found that equatorial forests do not form an impenetrable barrier to migrating swarms. The course of invasion from 1936 to 1938 is briefly outlined; since 1936, there has been a recrudescence of both species in the eastern part of the Belgian Congo. The districts in which field investigations have been carried out are enumerated.

Gibson (A.). Report on the grasshopper situation and organisation for grasshopper control in Canada (pp. 103–107, 3 maps). The two species that are economically important throughout Canada are *Melanoplus mexicanus mexicanus* Sauss., and *Camnula pellucida*, Scudd. Other species of economic importance and regions liable to invasions are enumerated, and the organisation of control and research services described [*cf.* **23** 311; **24** 444; **26** 440]. The value of crops lost and the expenditure on control for the years 1935–1937 are

tabulated ; in 1937, they totalled about 5,589,000 and 443,000 dollars, respectively.

Gibson (A.). The problem of grasshoppers, non-migrating, of North America (pp. 380–386). The last outbreak of grasshoppers in Canada, which started in 1931 and was still continuing in 1938, has demonstrated the importance of grasshoppers to Canadian agriculture and also the fact that the danger of outbreaks has not been eliminated by the extension of cultivation [*cf.* **26** 680]. Research on the best methods of control is concerned with the accurate delimitation of outbreak areas by means of surveys and intensive studies and concentration of control in such areas ; various carriers, poisons and attractants for poison baits are investigated, as well as effectiveness of control under different farming conditions. A forecast of grasshopper infestation in the Prairie Provinces in 1938 is included.

Chinese Delegation Situation acridienne et organisation antiacridienne en Chine (pp. 108–116, 2 maps). The injurious Acridids occurring in China are, in order of importance, *Locusta migratoria*, L., *Ceracris kiangsu*, Tsai, *Oxya chinensis*, Thnb., *O. intricata*, Stål, and *Chondacris rosea*, DeG. The distribution of the first two and areas subject to invasion by them are discussed and illustrated by a map [*cf.* **23** 638 ; **25** 62, 63]. Particulars are given of recent outbreaks of *L. migratoria* in Chekiang Province. Control measures against the Acridids consist in crushing and burning, driving into ditches, spraying with potassium cyanide solution and collecting the adults by hand ; preventive measures involve the cultivation of breeding areas situated on periodically flooded sandy reed-beds bordering the rivers in certain areas in Chekiang. An attempt to correlate the outbreaks recorded in Kiangsu Province since 1644 A.D. with drought indicated that they usually follow dry springs, less frequently the summer droughts, and rarely the winter ones.

Paniagua (S.). La situation acridienne en Espagne en 1938 (pp. 117–130, 2 figs.). The most injurious locust in Spain is *Dociostaurus maroccanus*, Thnb. ; in addition, *Calliptamus italicus*, L., is met with mainly in the east, and *S. gregaria* sometimes reaches the peninsula from Morocco. The principal breeding areas are given. They are situated mainly in the dry regions of Estremadura, La Mancha and Andalusia, and the outbreaks are most intense in regions containing large areas given over to pasturage. The area invaded annually averages 60,000 acres, while the damage involved in years of outbreaks of medium intensity is estimated at about 3 million pesetas ; in 1922–23 it reached 30 million. The organisation for carrying out control is outlined ; the best results are obtained from the use of arsenicals in sprays and baits. The text of the ordinance with regard to control is appended. Natural enemies of *D. maroccanus* include a Bombyliid, *Cytherea infuscata*, Mg., which sometimes destroys up to 50 per cent. of the egg-pods.

French Delegation. Situation acridienne et organisation antiacridienne dans les possessions françaises en Afrique (pp. 131–133). In French North Africa, the control of *D. maroccanus* in the outbreak centres was continued by ecological methods of cultivation and reafforestation. *S. gregaria* ph. *gregaria* has been absent for several years from the French African possessions, but field investigations on this species are continuing. Swarms of *L. m. migratorioides* continue to be present in French tropical Africa, where active control has to be carried out, and where the use of poisoned baits is becoming commoner.

In the French Sudan, good results were obtained from the use of chopped grass as a base, and from the substitution of saccharine for molasses. In Madagascar, some breeding up of *L. m. capito*, Sauss., and *N. septemfasciata*, Serv., has been observed since 1937 in the south-west of the Island [*cf.* **27** 62].

Besse (H.). Rapport sur la situation acridienne et l'organisation antiacridienne en Tunisie (pp. 134–143, 1 fig.). Tunisia is periodically invaded by *S. gregaria*, swarms of which appear in winter in the south and gradually migrate northwards ; in 1932 they oviposited over 148,000 acres. The organisation of locust control is outlined. Poison baits made with sodium arsenite or barium fluosilicate are extensively used. A diagram of a bait mixer employed in Tunisia is appended.

Isaakides (C. A.). Rapport sur la situation acridienne et l'organisation antiacridienne en Grèce (pp. 149–152). Greece is subject to outbreaks of *D. maroccanus* and *Calliptamus italicus*, which in former days used to inflict serious injury to crops of tobacco, cotton and vine ; in 1928 the damage was estimated at £1,350,000. Now, a duty of 10 man-days is levied among the population, control is systematically carried out by means of poison baits and cultivation, and the economic importance of locusts in Greece has declined.

Uichanco (L. B.). A report on the locust situation and locust control organisation in the Philippines (pp. 153–154). The regions of the Philippines subject to invasions of *L. m. manilensis*, Meyen, are enumerated, and the organisation for carrying out locust control is described.

In Resolution 7 (pp. 63–65), it is recommended that the locust investigations initiated by the Philippine Government be continued on a wider scale and by a special personnel.

Tammes (F. M. L.). The migratory locust in the Netherlands Indies (pp. 155–162, 2 figs.). In 1932 and again in 1935, swarms of *L. m. manilensis* (*migratorioides*, auct.) appeared in the Sanghidé and Talaud Archipelago, north of Celebes. There are indications that Celebes and Halmahera have been visited on previous occasions. The swarms apparently come from the Philippines ; on arriving, they either settle for a short time and then fly away, or scatter ; no definite cases of breeding have as yet been recorded.

Silvestri (F.). Rapporto del delegato italiano (pp. 163–164). Most of the information has been recorded from other sources [*cf.* **22** 605 ; **24** 811 ; **26** 592]. It is proposed to attach specialists to the agricultural experimental centres in Libya and in Italian East Africa for studies on the locust problem.

Chiaromonte (A.). Relazione sulla situazione acridica e sull' organizzazione antiacridica nella Libia e nell'Africa Orientale Italiana (pp. 165–170, 1 map). In Libya, the eastern provinces, particularly Bengasi, are subject to local outbreaks of *D. maroccanus* and *C. italicus*, while in the Derna province, *Decticus albifrons*, F., is causing minor damage. Invasions of *S. gregaria* occur only in western Libya (Tripolitania). Sprays of sodium arsenite and zinc barriers are used for control. Italian East Africa is subject to invasions by *S. gregaria* and *L. m. migratorioides*. A brief account of the recent invasions is given, illustrated by a diagrammatic map. Among various control methods in use, baits made of bran, or of coarsely ground sorghum, poisoned with 3 per cent. by weight of sodium arsenite, give the best results.

Duarte (A. J.). Brief account on the locust problem in Portugal (pp. 171–172). The only species of economic importance in Portugal is *D. maroccanus*, the last serious outbreak of which occurred in 1935 near the Spanish border east of Elvas. Control is carried out by supervising the breeding areas, where it is proposed to undertake ecological and biological investigations, and by cultivation, poisoning the grass with sodium arsenite and the use of flame throwers.

Saraiva (A. C.) & Cardoso (J. G. A.). Rapport sommaire sur la situation acridienne actuelle et l'organisation de la lutte antiacridienne dans la colonie portugaise du Mozambique (pp. 173–174). The only migratory locust still active in Mozambique is *N. septemfasciata*, which is at present restricted to the lower Zambesi basin. The systems of reporting and organisation for control, mainly by the use of poison baits, are briefly outlined. Research is concerned with the biology of *N. septemfasciata* and with the ecological characteristics of its preferred habitats.

Saraiva (A. C.) & Cardoso (J. G. A.). Aperçu sur les dernières invasions de sauterelles migratrices, en particulier du *Nomadacris septemfasciata* Serville, dans la colonie portugaise du Mozambique (pp. 175–182 1 fig.). The locust invasions in Mozambique since 1907 are recorded, and the course of the present one, which began in 1932 when swarms of *L. m. migratorioides* and *N. septemfasciata* made their appearance, is described in some detail. *L. m. migratorioides* is usually recorded in the north of Mozambique, which is only reached during the last stages of expansion from the outbreak centres; *Locustana pardalina*, Wlk., is recorded mainly in the sub-desert areas in the south. Swarms of *N. septemfasciata*, on the contrary, reach Mozambique at the time of their greatest development and in the central part of the colony find eminently suitable conditions for breeding and survival. Eggs are usually laid in humid clay soils in grassland areas. Swarms produced in Mozambique participated in seasonal migrations from south-east to north-west and in the return migration in the opposite direction [*cf.* **22** 46].

Anglo-Egyptian Sudan Delegation. Note on the locust situation in the Anglo-Egyptian Sudan from October 1935 to July 1938 and the organisation for control (pp. 183–185). During the winter of 1935–36, a very minor outbreak of *S. gregaria* occurred on the Red Sea coast, and in that of 1936–37, immigrant swarms, coming from the south, appeared at Tokar. Breeding was sufficiently extensive to necessitate control measures. Early in 1938, breeding believed to be due to immigrant swarms was reported on the coast north of Port Sudan. In 1935 and 1936, there were practically no reports of *L. m. migratorioides* in the Anglo-Egyptian Sudan, but in 1937 some swarms were reported. From February 1938, swarms appeared in the Sudan, coming from the south, and the invasion became widespread by July. The only swarm of *N. septemfasciata* was reported in June 1937, when it moved as far north as Kosti and Kassala, eventually breaking up in the Berber Province. A note on an organisation for the control of locusts, which is organised by administrative officers in co-operation with government entomologists, is appended.

Gradojević (M.). Rapport sur la situation acridienne et l'organisation antiacridienne en Jougoslavie (pp. 186–189). Most of the information has been already reviewed [*cf.* **26** 685]. The organisation of locust control in Jugoslavia, where *D. maroccanus* and *C. italicus* are

economically the most important species, followed by *Decticus verrucivorus*, L., *Arcyptera* (*Stethophyma*) *fusca*, Pall., and *Stenobothrus* and *Oedipoda* spp., is outlined.

Pasquier (R.). La lutte rationelle contre le criquet marocain en Algérie (pp. 367–379). The method of controlling *D. maroccanus* [*cf.* **26** 685] in the outbreak regions in the Departments of Oran, Algiers and Constantine in 1936–38 is described. By 1938, the system for reporting and supplying bait reached such efficiency that it became possible to restrict control operations to agglomerations of locusts that contained individuals belonging to ph. *congregans* and ph. *gregaria*. The cost of control was much reduced, and it is hoped that in future it will not exceed 200,000 francs a year. Phase changes were investigated in a laboratory, while ecological characteristics of locust habitats and the possibilities of altering them are being studied at a station established in an outbreak centre in ben Toumi.

In Resolution 5 (pp. 58–61), the opinion is expressed that the method of controlling *D. maroccanus* by concentrating on the outbreak areas, adopted by the Algerian Government, has proved highly effective, and the adoption of a similar preventive measure in other countries subject to outbreaks of this species is recommended

Déclarations et voeux de la délégation française (pp. 334–335). A brief survey of the work on locusts undertaken under the auspices of the Comité français d'Etude de la Biologie des Acridiens, in accordance with recommendations of the fourth Conference [**26** 676–688], and a programme of future field work in Africa, are given. The need of building up a preventive control organisation in the outbreak area of *L. m. migratorioides* in the French Sudan, and of continuing research in all outbreak areas of *Schistocerca gregaria* is urged.

United Kingdom Delegation. Locust investigations carried out in the period 1936–38 (pp. 144–148). An account is given of the work carried out under the auspices of the Economic Advisory Council, both in Arabia and Africa, and at the International Centre for Anti-Locust Research, where it involved collation and analysis of manuscript and printed matter, fundamental laboratory research on the effect of fluctuating temperatures and humidities on maturation of *S. gregaria*, *L. m. migratorioides* and *N. septemfasciata*, and investigations on the permeability of locust integuments to various poisons in the field. In Arabia some areas were surveyed to determine the presence of outbreak centres of *S. gregaria* [*cf.* **26** 198], and in Africa the behaviour of *S. gregaria* was studied in outbreak centres on the Red Sea coast of the Anglo-Egyptian Sudan [*cf.* **26** 6], and detailed ecological investigations were continued in the outbreak centre of *N. septemfasciata* on Lake Rukwa in Tanganyika Territory [**27** 387].

United Kingdom Delegation. Project of a central international organisation for the control of the outbreak areas of the tropical African locusts (pp. 399-402). The outbreak centres of *S. gregaria*, *L. m. migratoriodes* and *N. septemfasciata* can be successfully controlled only on the basis of international financial support. It is suggested that a permanent International Anti-Locust Committee composed of representatives of subscribing countries be appointed to control the funds and supervise the policy adopted in the control of outbreak centres, and that the International Centre for Anti-Locust Research be appointed as the executive body of the Committee. The functions of the Centre should comprise the collation and analysis of information on locusts throughout

the world. An estimate of expenditure required for its upkeep and of portions to be subscribed by different countries is proposed.

In Resolution 11 (pp. 66–69), the Conference record their appreciation of the work carried out at the International Centre and recommend its financing on an international basis.

Trinchieri (G.). Organisation internationale de la lutte contre les acridiens (pp. 403–405). The functions of the Centre for Locust Control at the International Institute of Agriculture in Rome are outlined, and the need for supplying it with data on locust control is urged. In Resolution 12 (p. 71), the Conference recommend that this should be carried out.

Mistikawi (A. M.) & Hussein (M.). Some observations on *Schistocerca gregaria* Forsk. in Egypt during 1937–38 (pp. 324–333, 2 maps). The appearances of *S. gregaria* in Egypt since 1932 are briefly recapitulated. In June 1937, after a winter of good rains, hoppers and adults of phases *solitaria* and *gregaria* were found in the Qattara depression in northern Libya. They were probably the progeny of invading swarms that came from south-eastern Sudan, where extensive breeding occurred in the 1936–37 season. In Qattara, eggs were laid in separate patches and the resultant hoppers tended to scatter and did not form marching bands. Some hoppers and adults of ph. *solitaria* were also observed on cultivation plots on the Mediterranean coast. No locusts were found in either area in April 1938. In early spring 1938, numerous hoppers and adults were noted on the Red Sea coast of Egypt, near Halaib, south of which the infested area stretched to Port Sudan. Here, as in northern Libya, where the campaign in 1937 cost £E.10,000, control was carried out by means of poison baits. The events of recent years demonstrate over again the danger to Egypt of invasions from outside and the urgent need of effective preventive control in outbreak centres.

Zolotarevsky (B. N.). Fonctionnement de la mission française d'études de la biologie des acridiens en 1936–1938 (pp. 336–341). A survey is given of field investigations on *S. gregaria* in Mauretania ; most of the results and conclusions have been summarised elsewhere [*cf.* **26** 755, 756]. The habitat of ph. *solitaria* in western Mauretania can be divided into three sections. That lying between 18°30′ and 19°30′N. lat., which lies in the Sahelo-Saharan zone, receives tropical summer rains and in the east merges with the distribution area of this species in the interior of the continent. Here, locusts were found both in summer and in winter. Further north, *Schistocerca* was found in winter in a region with a Mauretanian climate, characterised by oceanic winter rains. Here, the precipitation is very irregular and regions occasionally receiving heavy rainfalls may constitute auxiliary outbreak centres. The intermediate belt, lying approximately between 19°30′ and 20°30′ and receiving both summer and winter rains, contains the true outbreak centres. Considerable building up of locust population was observed there in the summer of 1937, which might have led to the appearance of ph. *gregaria* had the winter rains of 1937–38 proved favourable. Rapid variations in the density of population suggest the possibility of seasonal migrations of ph. *solitaria* in Mauretania [*cf.* **25** 161].

Hussein (M.) An expedition to Arabia for locust investigations (pp. 345–366, 6 maps). An account is given of field surveys of the coastal plains of Hedjaz and Yemen during the first half of 1937 carried out in accordance with the recommendations of the fourth

Conference [**26** 683], to determine whether they contain outbreak centres of *S. gregaria*. In Hedjaz, the survey extended from Wej to Mecca, and in Yemen, from Hodeida to Aden, with incursions inland. An account is given of the topography, drainage, soils, vegetation and climate of the areas traversed. Solitary-living individuals were found in a number of localities, but the only examples of phase *gregaria* were seen in an area with dry, salty soil near Gizan ; they were probably stragglers from a small swarm originating somewhere on the Arabian or African Red Sea coast. It is probable that there are no outbreak centres in Hedjaz owing to unfavourable climatic conditions, but there may be some in parts of the Tehama of Yemen. Further field investigations are essential before final conclusions can be drawn.

United Kingdom Delegation. Scheme of the permanent international organisation for the preventive control of the desert locust (*Schistocerca gregaria*, Forsk.) in eastern Africa and western Asia (pp. 342–344). The known outbreak centres of *S. gregaria* on the Red Sea coasts of Africa and Arabia and suspected outbreak centres in Arabia and Iran are enumerated, and a plan of an organisation for their supervision and control, together with estimates of its cost, is proposed. The organisation should have its headquarters in Port Sudan and Jidda and a staff working under the direction of the International Anti-Locust Committee to be financed by interested countries, whose subscriptions are specified. In Resolution 10 (pp. 66–69), this scheme is approved, and the speedy creation of such an organisation is recommended.

Brédo (H. J.). Note sur un voyage d'étude entrepris sur les rives orientales du lac Albert, dans la région de Butiaba (Uganda), en vue d'y rechercher la présence de *Locusta migratoria migratorioides* R. et F. phase *solitaria* (1937) (pp. 315–319, 1 fig.). A survey of the eastern shore of Lake Albert in Butiaba, Uganda, in September 1937 established the presence and probable breeding of solitary individuals of *L. m. migratorioides*, two and a half years after the last swarms had been seen there. *N. septemfasciata* ph. *solitaria* was also present.

French Delegation. Co-opération internationale dans la surveillance et la lutte sur l'aire grégarigène du criquet migrateur africain (*Locusta migratoria migratorioides* Rch. & Frm.) (pp. 320–323, 1 map). The outbreak area of *L. m. migratorioides* in the river Niger inundation zone in the French Sudan is exactly delimited and illustrated on a map. A plan for creating a body responsible for supervision and control in the outbreak area is proposed, according to which its organisation and administration are to be carried out by the French authorities and their entomological officers. The actual work is to be in charge of a specially appointed entomologist, who is to be responsible to the directing committee, working in co-operation with the International Centre for Anti-Locust Research. An estimate of the cost of such an organisation and of portions to be subscribed by the interested countries is appended. In Resolution 4 (pp. 59–61), this plan is approved by the Conference.

Brédo (H. J.). Note sur la présence des *Nomadacris septemfasciata* Serv. dans les plaines du lac Albert (pp. 266–274, 1 fig.). Isolated examples of *N. septemfasciata* were found in the autumn of 1935 on the shores of Lake Albert, Belgian Congo, before any swarms had been observed there, and by 1937 their density had increased considerably. Their biometrical study indicated that some were near ph. *solitaria*,

and others ph. *gregaria*. Some notes on the vegetation, climate and other Acridid members of the fauna are included.

Brédo (H. J.). Recherches relatives aux foyers d'origine des *Nomadacris septemfasciata* Serv. dans les régions nord-est du Kivu et du Ruanda (pp. 275–285, 1 map). In April–May 1937 a survey was made of these regions, where swarms had concentrated between 1931 and 1935. Isolated individuals were found to the north-east of Kagera and on the Ruindi plains, near Lake Edward ; they occurred only on the hot and humid low-lying plains overgrown by grasses, which are enumerated, and their biometrical characteristics suggested that they were stragglers from swarms.

Brédo (H. J.). Recherches dans les foyers d'origine des *Nomadacris septemfasciata* Serv. (région du lac Moero et nord de la Rhodésie du Nord. Novembre 1937 à Janvier 1938) (pp. 286–301, 1 map). Comparative observations on vegetation, meteorological conditions and Acridid fauna were made on the plains of the Luapula and of Lake Mweru, whence arose the swarms of *N. septemfasciata* that invaded the surrounding areas in 1930, and of Mweru-Wantipa in Northern Rhodesia, where known outbreak centres of this species occur. Isolated individuals were found in many areas, and their biometrical study showed that they mostly belonged to ph. *solitaria* or ph. *transiens*. Both the vegetation and the microclimate of the Luapula and Mweru plains differed from those of the Wantipa plains, and no breeding or outbreak centres of ph. *gregaria* could be found there. No examples of *L. m. migratorioides* could be found throughout the surveyed areas.

Brédo (H. J.). Recherches sur la présence de *Nomadacris septemfasciata* Serv. dans les plaines du Lac Bangwelo (Congo et Rhodésie, Mars 1938) (pp. 302–306). The ecological conditions of the immense marshy plains to the south of lake Bangwelo were surveyed. A description is given of their natural vegetation and climatic conditions. During the period of the survey, the whole of the plain, except for isolated islands of higher ground, was covered by water, and no examples of *N. septemfasciata* were found. It is concluded that owing to the floods, which prevent oviposition, and the low night temperatures, this region cannot serve as a permanent breeding area for this species.

Portuguese Delegation. Bases de coopération internationale pour la lutte contre le *Nomadacris septemfasciata* Serville (pp. 313–314). Preventive control of *N. septemfasciata* in the known and potential outbreak centres should be carried out by the Governments of the countries in which they happen to be situated, with the financial cooperation of other interested countries.

Belgian Delegation. Principes généraux de l'organisation permanente pour le contrôle des foyers d'origine du criquet nomade (*Nomadacris septemfasciata* Serv.) (p. 265). Sufficient data are available on the outbreak centres of this species to make possible the speedy establishment of a permanent control organisation in them.

United Kingdom Delegation. A scheme of permanent international organisation for the control of outbreak areas of the Red Locust (*Nomadacris septemfasciata* Serville, 1839) (pp. 307–310, 1 map). The known and potential outbreak centres of *N. septemfasciata* in Africa south of the equator are enumerated, and a scheme for an international organisation for their permanent supervision and control, together with estimates as to its cost, is proposed. Such an organisation should have

its headquarters at Abercorn in Northern Rhodesia, and its staff should be employed by the International Anti-locust Committee to be financed by the interested countries. A map of major and minor outbreak centres in Tanganyika and Northern Rhodesia is appended.

The scheme of a permanent international organisation for the control of the outbreak areas of the Red Locust (*Nomadacris septemfasciata* Serville, 1839) (pp. 76–81), which formed the basis of an agreement between Britain and Belgium, elaborates the functions of this body and includes an estimate of the capital and annual expenditure.

Saraiva (A. C.). Suggestion d'un plan général de lutte contre le *Nomadacris septemfasciata* Serville (pp. 311–312). The parts of Mozambique suspected to contain outbreak centres of *N. septemfasciata* are treeless areas, with wet, compact soils, overgrown by fairly dense herbaceous vegetation and interspersed with temporary marshes ; these conditions are characteristic of outbreak centres in other countries. The best way of controlling *Nomadacris* in such areas is to render them unsuitable as habitats for this species either by annual cultivation or by afforestation.

In Resolution 9 (pp. 62–65), the Conference considered that such methods of controlling *N. septemfasciata* in outbreak centres offer theoretical advantages and should be tested in practice.

Zolotarevsky (B. N.). Les subdivisions des aires grégarigènes et leur rôle dans la transformation des phases (pp. 258–264). The earlier terminology for designation of outbreak areas of swarming locusts [*cf.* **26** 679] is reviewed, and the following one is proposed. An outbreak centre is a place in which ecological conditions bringing about the transformation of ph. *solitaria* into ph. *gregaria* may occur. Several outbreak centres, when they are determined by similar factors, can be grouped into outbreak areas of various dimensions ; two or more outbreak areas adjoining each other but within which phase transformation is brought about by dissimilar factors will constitute an outbreak region. Outbreak areas can be divided into outbreak districts, differing from each other by factors of secondary importance, and individual groups of outbreak centres within the district will form outbreak sectors. Finally, a group of places in which breeding up of ph. *solitaria* occurs, prior to its migration into outbreak centres, is designated as an auxiliary multiplication area.

Saraiva (A. C.). Quelques réflexions sur les facteurs orientateurs des mouvements des essaims du *Nomadacris septemfasciata* Serville (pp. 248–251). The seasonal migrations of *N. septemfasciata* in Africa south of the equator to the north-west during the dry season, and to the south-east during the rains, must be due to the reactions of the locusts to temperature and not to movement of the rain-belts [*cf.* **22** 46], although air humidity and the colour of vegetation may be important factors in determining the direction of flight towards the end of the return migration. The reaction of swarms towards the thermal equator, which is positive during the first immigration, but subsequently becomes negative, is probably due to physiological changes in the organism connected with sexual maturation.

Ramchandra Rao (Y.). A further note on studies of migration among the solitaries of locusts in N.-W. India in 1936–1938 (pp. 238–247). The data presented on migrations of ph. *solitaria* in *S. gregaria* and *L. migratoria* have been summarised elsewhere [**25** 161, 390 ; **26** 628].

Gibson (A.). Migrations of locusts in Canada (p. 237). Important migrations of *M. mexicanus* and, to a less extent, of *Camnula pellucida* have been recorded in Canada in the form of the invasions of Saskatchewan from the United States in 1932–1933, 1935 and 1937, or the migration in the opposite direction in 1934. The movements do not occur in swarms, though large numbers of grasshoppers may be visible, all apparently moving in the same direction, and the main evidence of influx is the increase in numbers of grasshoppers. Similar infiltrations have been observed from dry regions into areas providing succulent food.

In Resolution 3 (pp. 54–58), attention is drawn to the possible importance of migrations of solitary locusts and grasshoppers in the causation of outbreaks, and the use on a large scale of the method of marking individual locusts for observation on their migrations is recommended.

Ramchandra Rao (Y.). A preliminary note on a study of locust infestations in North-West India since 1863 in relation to sunspot cycles (pp. 252–257, 1 fig.). A graph of outbreaks of *S. gregaria* (expressed by the extent of invasion and damage to crops) shows that they occur in cycles. A comparison of this graph with one showing sunspot fluctuations indicates that there is a negative correlation between the locust infestations and sunspot numbers [*cf.* **24** 810]. The years of occurrence of initial outbreaks are within the periods of low sunspot numbers, and occur just before, during or just after the year of sunspot minima. The outbreaks continue to increase year by year while the sunspot numbers remain below 30, but the decline of an outbreak usually sets in before the sunspot curve has reached its peak. It is suggested that since at present the sunspot numbers have risen above 30, India will remain free from swarms until the next decrease of sunspot numbers. The occasional lack of correspondence between the curves must be due to the fact that in North-West India, the development of outbreaks depends on favourable conditions in two areas, namely, Baluchistan, and the deserts of north-western India [*cf.* **25** 161]. The effect of solar fluctuations on weather, which controls the multiplication of locusts, may be different in these two areas.

Uichanco (L. B.). Studies on the relation of climate to distribution of migratory-locust outbreaks in the Philippines (pp. 387–398, 5 figs.). An analysis of outbreaks of *L. m. manilensis* in the Philippine Islands shows that at the beginning of an outbreak the infestation is confined to certain areas in Mindanao. Later, swarms spread to other islands, especially of the Visayan group, and to the Bicol and Boudoc peninsulas of Luzon. After a further extension over Luzon and some other islands, the outbreak dies down. An attempt was made to evaluate the climatic factors characterising the less and the more frequently infested islands and areas [**24** 810]. The following sequence of seasonal weather was found unfavourable for outbreaks: (*a*) an excessively wet rainy season, (*b*) a somewhat cold and dry winter, and (*c*) a hot dry season. More frequently infested localities are characterised by a more uniform distribution of rainfall and temperatures throughout the year, the range between mean maxima and minima of temperatures in them being 15·72°C., while in the less frequently infested areas it is 19·34°C. There is some parallelism in the distribution of areas favourable to locusts and that of Manila hemp (*Musa textilis*), which may therefore be used as an indicator. It is

concluded that east-central Mindanao is probably an outbreak area of swarms spreading beyond the Philippines, to Formosa, Eastern China, Sangir, Talaur, northern Celebes, Borneo, the Malay Peninsula and Annam.

Brédo (H. J.). Phases du *Nomadacris septemfasciata* Serv. au Congo Belge (pp. 406–409, 6 figs.). Descriptions are given of larval instars of ph. *solitaria* or ph. *dissocians* bred from eggs laid in cages by ph. *gregaria* adults collected on the shores of Lake Albert, Kesenyi, Belgian Congo [*cf.* **22** 263]. In Resolution 2 (pp. 55–57), it is considered that standardisation of methods in studying phase transformation is desirable, but owing to the variety of local conditions, discretion in the matter should lie with specialists in the field.

Mukerji (S.) & Batra (R. N.). A note on the post-embryonic development of eye-stripes and their correlation with the number of larval instars and the antennal segments in the life-cycle of *Schistocerca gregaria* Forsk. (pp. 410–415, 3 tables). The numbers of eye-stripes and of antennal segments are both related to the number of instars undergone by given individuals [*cf.* **24** 634 ; **26** 628], and there is probably an organic connection between the three factors.

Debauche (H.). Les principaux organes sensoriels de l'antenne chez *Schistocerca gregaria* Forsk. (pp. 417–433, 4 pls.). Detailed anatomical and histological descriptions are given of the chordotonal scoloparia of the pedicellus and scapus and of Johnston's organ (the 14 scoloparia on the periphery of the pedicellus) in *S. gregaria* ph. *solitaria*.

Hers (J.). Organe tympanal du *Schistocerca gregaria* Forsk. (pp. 434–445, 1 pl., 6 figs.). A detailed anatomical and histological description is given of the tympanal organ in *S. gregaria*.

Resolutions 13 and 14 (pp. 70–73) deal with the organisation of future conferences. The convening of more sectional and geographically limited meetings is recommended ; and the International Locust Conference should meet at intervals of more than two years.

Lepesme (P.). **Parasites et pseudoparasites du criquet pélerin en élevage.**—*Bull. Soc. Hist. nat. Afr. N.* **30** pp. 38–43, 2 pls. Algiers, 1939.

Gregarina acridiorum is recorded from the digestive tract of *Schistocerca gregaria*, Forsk., bred in captivity in Paris, but does not appear to cause any injury to the locust. Sexual maturation in one lot of locusts was prevented by an undetermined organism, possibly belonging to the Coccidia, which could not be cultivated on any artificial media.

Vayssière (P.) & Lepesme (P.). **Observations sur le criquet pélerin (*Schistocerca gregaria* Forsk.) au laboratoire central de biologie acridienne du 1er Mai 1935 au 1er Mai 1938.**—*Bull. Soc. Hist. nat. Afr. N.* **30** pp. 44–61, 2 figs., 3 pls. Algiers, 1939.

Some observations are recorded on the coloration and biometrics of *Schistocerca gregaria*, Forsk., bred in a laboratory at Paris since 1935. The coloration of hoppers and adults reared under different conditions was more variable than their biometrical characters, and neither were sufficiently reliable to be used for the study of phase variation. Some notes on the technique of locust breeding are appended.

Murat (M.). **Recherches sur le criquet pélerin** (*Schistocerca gregaria* **Forsk., Acrididae) en Mauritanie Occidentale (A.O.F.) et au Sahara Espagnol, années 1937 et 1938.**—*Bull. Soc. Hist. nat. Afr. N.* **30** pp. 105–204, 7 pls., 5 figs., 1 fldg map, 33 refs. Algiers, 1939.

Following earlier work in western Mauretania to determine the distribution there of *Schistocerca gregaria*, Forsk., phase *solitaria* [*cf. R.A.E.*, A **26** 755], further ecological surveys were carried out in 1937 and in 1938 in the littoral and interior of Mauretania and in the coastal areas of Rio de Oro.

The geological structure, climate and vegetation of the areas considered are discussed, and descriptions and photographs are given of the habitats in which examples of *S. gregaria* were found. A biometrical study of the latter showed that they all belonged to phase *solitaria*. It was found that in western Mauretania the area of distribution of this phase lies between 18°30′ and 20°N., but near the coast it extends northwards at least as far as 23°30′N. In its southern part, corresponding to the Sahelo-Saharan belt, the density of the locust population undergoes considerable fluctuations, in accordance with seasonal changes in climate. Thus, in Akjoujt, after the plentiful summer rains of 1937, locusts were numerous in September, and their numbers were still greater in November, by which time another generation had been produced, but the population almost disappeared during the 1938 dry season. In general, the species is found in various types of habitats during the rainy season, but can survive permanently only in the localities designated as "conservation areas," in which the vegetation remains fresh during periods of drought. Migrations of phase *solitaria* over distances of up to about 12–18 miles, in connection with extension and restriction of suitable habitats with seasonal climatic changes, undoubtedly take place in Mauretania, but the existence of migration on a larger scale [*cf.* **25** 161] has not yet been proved.

Within the distribution area in western Mauretania, relief conditions in three areas bring about a concentration of moisture, so that they offer favourable habitats, and together constitute the western outbreak centre of the species. These are the littoral hills at Cap el Freh, the broken uplands of Inchiri around Akjoujt, and parts of Mauretania Adrar.

In the Saharan zone, lying to the north of 20°N., the distribution of *S. gregaria* in the coastal belt was found to be very erratic. Here climatic conditions are so unfavourable that during dry periods the species may be completely eliminated over large areas. Should this zone receive good rains during the years when swarms are being built up in outbreak centres further south, it would offer suitable sites for breeding to the first migrating swarms.

Progress Reports from Experiment Stations Season 1937–1938.—Med. 8vo, iv+150 pp., ill. London, Emp. Cott. Gr. Corp., 1939. Price 2*s.* 6*d.*

The pests of cotton in Africa during 1937–38 are discussed as in previous years [*R.A.E.*, A **26** 364, etc.]. F. S. Parsons & J. Marshall (pp. 28–35) report from Barberton (eastern Transvaal) that observations on the American bollworm [*Heliothis armigera*, Hb.] were again confined to surveys of the three types of breeding areas [*cf. loc. cit.*].

The attacks of this bollworm were generally inconsiderable. There was an early and moderately heavy infestation on maize and also on cotton due to moths bred on weeds and early summer (irrigated) crops. Females resulting in February from this first generation also oviposited mainly on maize. There was a third and smaller flight of moths in April, and egg-laying on beans of *Dolichos lablab* increased. Considerable oviposition occurred 72 days before flowering on *D. lablab* grown from seed from Gatooma (Southern Rhodesia), where extensive egg-laying both before and during flowering was reported in the previous year [**26** 366], but only when flowering began were eggs laid on two other strains that had a shorter growing period and flowered earlier. The Rhodesian plants emit a strong scent, even when young, whereas the others do not. At the peak of oviposition, two or three times as many eggs per acre were laid on maize in tassel as on *Dolichos*, but during April when cotton was the only other crop with fresh growth, practically all oviposition occurred on the one small field of *Dolichos*. Only 1·4 per cent. of the larvae feeding on *Dolichos* matured. Preliminary observations on possible strain variability of *H. armigera* from Gatooma, Barberton and the Sudan failed to reveal any morphological differences, except in the degree of pigmentation of the hind wing. The genitalia were alike, and fertile crosses were obtained with each of the possible combinations. For the first time for four years, there was a departure from the usual course of flights, moths emerging extensively during the dry season some weeks before they were expected. This was attributed to the fact that the season was comparatively wet and the moisture content of the soil high [*cf.* **27** 15]. In an investigation of ovarian development, B. L. Mitchell found that most, if not all, of the ovules were differentiated by the first day after pupation. They grew steadily and continuously until the emergence of the moth, but at the time of emergence, none had reached the lower part of the ovarioles. In fed moths, the ovarioles swell rapidly and ripe eggs are present on the second day after emergence. Pairing, which stimulated egg-laying, did not occur until the fourth day and then only if both sexes had taken food. Histolysis of the larval fat-body begins one day after normal pupation and occupies about 6 days ; the building-up of the digitate fat-body of the adult begins about the seventh day. Studies on the class of food consumed by larvae of various ages under natural conditions provided data that afford a means of calculating the range of food available to larvae hatching from each batch of eggs laid nightly. Investigations on crop production in relation to losses from attack by *H. armigera* indicate the importance of protecting the earlier-formed bolls from attack.

F. S. Parsons & H. Hutchinson (pp. 35–38) report from Swaziland that there was practically no oviposition in January by females of the red bollworm [*Diparopsis castanea*, Hmps.] on *Cienfuegosia hildebrandti*, on which a generation is usually produced before wild cotton bears fruit [*cf.* **26** 365], because bolling had ended abruptly in December following a rainless period, but there was oviposition on wild cotton, which was unseasonably in fruit at the time. As the trend of moth emergence from pupal cages has not always been in conformity with that of oviposition in the field, either in time or quantity, experiments were set up in which individual cages were used as before, but the action of predators and such factors as soil and moisture differences was permitted. Emergence in the riverside soil area followed much the same course as that in the cages, but there were

earlier emergences in the field. Three times as many adults emerged from overwintering pupae in protected cages as in the field, some 42 per cent. of the pupae in the field having apparently been destroyed by ants (possibly species of *Pheidole*), many before June and others from late August onwards. In both the protected cages and those in the riverside sites, pupae formed late in May contributed the highest proportions of adults. Emergence from drier sites and those with a less readily penetrable soil was much delayed. Owing to the diversion of moths from *C. hildebrandti* to wild cotton in January, half the larvae bred on cotton over the whole season resulted from eggs laid in January. The percentages of larvae reaching maturity on *C. hildebrandti* on the edges of a river and a moist depression and on a comparatively dry ridge were 6, 6·1 and 8·5, respectively.

Observations and experiments carried out by P. A. Bowmaker at Magut, Natal, in co-operation with workers at Barberton are described on pages 38–39. There was a significant increase in yield of 105 lb. seed cotton per acre on plots on which bollworms and stainers [*Dysdercus* spp.] had been controlled by hand collection. *Dolichos* from Gatooma was much more attractive to ovipositing females of *H. armigera* at Magut than at Barberton. R. C. Rainey (pp. 40–42) reports on investigations showing that stainers are subject to very varied conditions during the dry season. A minimum relative humidity of 9 per cent. and air temperatures ranging from 34 to 93°F. were recorded from a clump of *Hibiscus calyphyllus*, while beneath soil débris a foot or two away, the minimum relative humidity was 71 per cent. and the temperature ranged from 50 to 62°F. On beans, access to advanced green fruit was essential for the development of larvae of *H. armigera* to full-size pupae, whereas no significant differences were observed in the nutritive value of any of the fruiting stages of peas.

E. O. Pearson (pp. 42–52) reports that the incidence of *Dysdercus nigrofasciatus*, Stål, on *H. calyphyllus* followed the same general trend as during the previous year [**26** 365], but the generations overlapped more. The population of nymphs of the second, third and fourth instars was 15 times as great at Barberton in the 1938 as in the 1937 dry season, the wettest and driest, respectively, ever recorded at the station. *D. intermedius*, Dist., was again the main immigrant to *Sterculia rogersi* at Barberton, *D. nigrofasciatus* appearing in one of the four recording colonies only. *D. fasciatus*, Sign., was again generally absent from wild food-plants; the conclusion that wild cotton and *C. hildebrandti* are not food-plants of this species was confirmed. In an attempt to estimate the true stainer population on *H. calyphyllus* near Barberton by a method similar to that used in the study of tsetse-flies in Tanganyika [B **22** 12], stainers were captured at weekly intervals, marked with different colours each week, and released. The numbers of marked stainers recaptured in successive weeks decreased in approximately geometric progression. The proportion marked of the population actually present on the first occasion was calculated by extrapolation, and averaged 30 per cent. for the season. The numbers available were not large enough to give reliable estimates of true populations, but a weekly dispersal of 40–50 per cent. over the whole season is indicated. The percentage of recaptures fell most rapidly when breeding was at its height, suggesting that the time of maximum breeding is also the time of maximum rate of dispersal. Dispersal was previously believed to occur only when conditions on the food-plant were becoming unfavourable, but it is

now thought to be almost always in progress, but to be offset by immigration to food-plants in a favourable condition. *H. trionum* and *H. cannabinus* were shown to occur in sufficient quantity as weeds of cultivation in northern Swaziland to be very important factors in the bionomics of stainers in native areas. Investigations on the possibility that *D. nigrofasciatus* passes the period between July and November on *Dombeya rotundifolia* [**26** 365] are being continued, and the possibility of direct survival is again being examined. In the insectary, 6 and 9 per cent. of newly emerged adults of *D. nigrofasciatus* fed on water and seed cotton and water and nectar, respectively, survived for 18 weeks, so that adults produced late in the season might survive until November in numbers comparable with those constituting the November flight. There was little difference in the rate of survival on water and seed cotton, water and nectar and water only until the adults were 6 weeks old. Adults produced in mid-June could thus survive on water, which is freely available in the form of dew, until the end of July, when *Dombeya* and other trees and shrubs come into flower. Pairing occurred sporadically among individuals fed on nectar and water, but no female matured eggs, whereas on seed-cotton, egg-maturation occurred in females 2–3 weeks old and oviposition followed. The death-rates for males and females of both *D. nigrofasciatus* and *D. fasciatus* on nectar and water and on water alone were about the same, but the death-rate of females fed on seed-cotton rose sharply at the conclusion of oviposition. The dry weights of adult males after ether extraction declined in much the same way whether the stainers had been fed on water and nectar or water alone. The decline was rapid at first, but later much more gradual. It became gradual sooner in *D. fasciatus* than in *D. nigrofasciatus*. The decline in nitrogen was of an order to be expected on the assumption that the fall in extracted dry weight represents a utilisation of protein. Weight of fat declined in a similar manner to non-fatty dry weight in the case of stainers of both species fed on water. The death rate rose rapidly as the basic levels were reached. Fat weights in *D. fasciatus* fed on water and nectar behaved much as in individuals fed on water, but in *D. nigrofasciatus* so fed, they declined sharply in the first fortnight and then increased, until after 10 weeks they were at practically their initial value. *D. nigrofasciatus* therefore possesses to a marked degree the ability to synthesise fat from monosaccharides. The difference between the two species in this respect is reflected in the survival figures on nectar.

In experiments in the insectary on the length of life of stainers on wild food-plants, *D. nigrofasciatus* developed most rapidly and showed the greatest increase in live weight for individuals less than 1 day old on seeds of baobab [*Adansonia digitata*], *Thespesia rogersi* (on which it is rarely if ever found), *Sterculia rogersi* and cultivated cotton. Development took about a week longer and live weights averaged only $\frac{2}{3}$ as much on the commoner species of *Hibiscus* while on *D. rotundifolia*, development took twice as long and mortality was heavy. *D. fasciatus* also developed most rapidly and successfully on seeds of cotton and the arboreal food-plants, but it also matured, though more slowly and with a reduced live weight, on the commoner species of *Hibiscus*, on which it is rarely found in the district. Development was more rapid and adult live weights greater on *H. dongolensis* and *H. vitifolius*, which are preferred food-plants in other countries, than on *H. calyphyllus*, and whilst pairing and egg

production occurred freely on the first two, they were to a great extent inhibited on the last-named.

In a study of the effects of temperature and humidity, relative humidities between 70 and 100 per cent. had no effect on the percentage hatch of eggs of *D. fasciatus*, but below 70 per cent. hatching fell rapidly, and none occurred at 50 per cent. Hatching appeared to depend on the difference between the rates of development and desiccation. First-instar nymphs failed to survive at relative humidities below 90 per cent. in the absence of free water. The lowest constant temperature at which eggs of *D. fasciatus* and *D. nigrofasciatus* hatched, at a constant relative humidity of 100 per cent., was 61·4°F. No eggs of *D. nigrofasciatus* that had been kept at 51·8°F. or less for 5 days and then removed to an optimum temperature hatched. Following removal to optimum temperature after exposure for 5 days to 54·0 and 57·9°F., 22 and 36 per cent., respectively, of the eggs of this species hatched. At constant temperatures above 86·5°F., no hatching occurred in either species. Exposure of newly laid eggs of *D. nigrofasciatus* for 1 hour to 98·2 and 93·5°F. resulted in 0 and 54 per cent. hatch, respectively. Eggs of both species were able to withstand much higher temperatures when 5 days old; 101·5°F. for 1 hour was not fatal, but 108·6°F. was. Exposure for 24 hours to temperatures of 88·6°F. and upwards was fatal to newly laid eggs of both species, but eggs 5 days old again withstood higher temperatures, 93·2°F. not being fatal, though 95·9°F. was. Within the range 16–30°C., the logarithm to the base 10 of the incubation period in days equals 21·5 divided by the temperature in degrees Centigrade.

It was demonstrated statistically in an experiment carried out by P. A. Bowmaker at Magut that the amount of staining depends on the ratio of stainers to bolls and not on the absolute stainer population. Close spacing increased the stainer population, the ratio of stainers to bolls and the degree of damage. This was probably due, however, to the effect of spacing on earliness. A new range of four grades (numbered 0 to III) for assessing stainer damage, which varies inversely with the age of the boll at the time of inoculation, was prepared by inoculating sterile bolls at weekly intervals with a standard spore suspension of *Nematospora gossypii*. In bolls 1–2 weeks old, inoculation with 0·2 cc. sterile water caused complete abortion, but it did not affect older bolls.

J. E. Peat & A. N. Prentice (pp. 70–74) report from Southern Rhodesia that attack by Jassids was moderate, but the importance of growing highly resistant strains is nevertheless emphasised. There was scattered oviposition by *H. armigera* on cotton in January and early February; it increased in the second week in February just before flowering began, and the peak was reached early in March. Comparatively few eggs were laid on maize, which tasselled early in March. There was a variable amount of oviposition on Rhodesian *Dolichos* for more than a month before it began budding, in the last week of February, after which it became more attractive. Egg-laying rose to a peak towards the end of March, soon after the majority of the plants were in flower. Plants of *Dolichos* raised from seed obtained from the Sudan came into flower considerably earlier than the Rhodesian *Dolichos*, but oviposition on it in February was no greater. Oviposition on cotton at its most attractive stage in late February and early March was as heavy as, or slightly heavier than, oviposition

at the same time on Rhodesian *Dolichos*, but after the middle of March, egg-laying was much heavier on Rhodesian *Dolichos*, which was at the most attractive stage, than on cotton, on which flowering was declining rapidly. Rhodesian *Dolichos* comes into flower about a month too late to be of maximum value as a trap crop, and the Sudan *Dolichos*, which flowers earlier, is not sufficiently attractive. The survival from eggs laid on maize and Rhodesian *Dolichos* early enough to affect oviposition on cotton is being investigated. Larvae found in the fifth and sixth instars on Sudan *Dolichos* in mid-February, and probably hatched from eggs laid about the end of January, gave rise to adults during the period of heavy egg-laying on field cotton. A large population of fifth- and sixth-instar larvae found on self-sown gram [*Cicer arietinum*] at the end of January could have become moths in time to contribute to the main egg-laying on cotton had the plants not been destroyed. Fifth- and sixth-instar larvae that pupated in cages from the end of March until mid-May emerged from April until mid-September. Fairly marked egg-laying by the Sudan bollworm [*Diparopsis castanea*] occurred in January on cotton plants one month old. The food was probably unsuitable for larval development. Oviposition decreased towards the end of January, was at its minimum during February and March, and increased about the end of March, reaching a peak in April. The first adult stainers were observed in the crop early in March, about two weeks after flowering began, and adult populations were small until mid-April, *Dysdercus fasciatus*, *D. intermedius* and *D. superstitiosus*, F., being present in approximately equal numbers. At the beginning of May, the adult population of *D. fasciatus* started to increase noticeably, but that of *D. intermedius* showed no marked increase and that of *D. superstitiosus* remained small. Staining was negligible.

A. G. Bebbington & W. Allan (pp. 75–78) report from Northern Rhodesia that attack by *D. superstitiosus* was extremely low and that by *D. fasciatus* comparatively so; *H. armigera* (*Chloridea obsoleta*, F.) caused serious damage in a few cases only. Records on *D. superstitiosus*, *D. fasciatus*, and *D. intermedius* were made in all the areas described in the previous year's report [**26** 366] and also in the lower Zambesi valley [**27** 222]. Migration of *D. superstitiosus* to *Triumfetta* spp., which was considerable, was first observed in October 1937. As no large populations had ever been observed during July–September, a series of daily searches was made during these months. Quite a large survival of nymphs and some adults were found on *Hibiscus asper* and *H. cannabinus* in the southern transitional area, but not in the northern and southern plateaux. Very large numbers occurred on *Hibiscus* spp. in the lower Zambesi Valley, and a number of new food-plants of this genus were recorded. *Thespesia rogersi* flowered early and abundantly. Consequently, *D. fasciatus* left the trees later and more slowly than during the previous year [**26** 367], and damage to cotton was less in all districts.

G. B. Wallace & W. V. Harris (pp. 116–117) state that the pink bollworm [*Platyedra gossypiella*, Saund.] was discovered on cotton on the shore of Lake Victoria in north-western Tanganyika [*cf.* **25** 362]. At Lubaga, slightly further south, it was not found; Jassids were severe early in the season and were followed by *D. fasciatus*, which appeared abnormally early. *Diparopsis castanea* is present in the Songea highlands.

Kalshoven (L. G. E.). **Een groote boorder in het hout van meubels in Nederlandsch Indië** (*Stromatium longicorne* **Newm.**). [A large Borer in the Wood of Furniture in the Netherlands Indies.]—*Ent. Ber. Ned.-Ind.* **5** no. 1 pp. 1–10, 1 fig., 1 pl., 15 refs. Buitenzorg, 1939; also in *Tectona* **32** pp. 219–229. (With a Summary in English.)

Instances are recorded of infestation by larvae of *Stromatium longicorne*, Newm., of wooden furniture in the Netherlands Indies, and the previous records of this Cerambycid from Java are quoted; it is apparently commoner in Sumatra and the Moluccas. References in the literature to infestation of wood by species of *Stromatium* are reviewed, and the larva and adult of *S. longicorne* are briefly described. A larva taken in December 1936 was still in the same instar in August 1938.

Middelburg (H. A.). **Jaarverslag** [Annual Report of the Vorstenland Tobacco Experiment Station, Java] **1937–1938.**—*Meded. Proefst. vorstenl. Tab.* no. 87, 73 pp., 3 pls. Klaten (Java), 1939.

In his report on the phytopathological division (pp. 23–46), T. H. Thung gives notes on several virus diseases of tobacco in the Vorstenland district. In one of them, known as perforation disease, the leaves are deformed and holes appear in them. Observations showed that the virus was transmitted to tobacco by the Aphid, *Myzus persicae*, Sulz., from plantations of *Capsicum*. In another, which he calls D-disease, the leaves become crinkled and covered with conspicuous white spots. There are indications that the virus of this disease is carried by insects, and one case of transmission of it by an Aleurodid of the genus *Bemisia* was observed.

Contradictory results have been obtained by planters using derris against thrips [*Isoneurothrips parvispinus*, Karny] on tobacco [*cf. R.A.E.*, A **25** 635], owing to incorrect spraying and the poor quality of the insecticide. In investigations, a rapid polarimetric method was adopted to determine the rotenone content of derris powders, and the results obtained agreed fairly well with those of biological tests [*cf.* **23** 523]. A satisfactory spray was prepared by adding 2 parts by volume of neutral coconut oil or ground-nut oil to 8 parts of a benzene extract of powdered derris containing 10–12 per cent. rotenone. This was diluted for use and gave 98–100 per cent. mortality of the thrips. The addition of the oil serves mainly to reduce the risk of scorching.

Nezara viridula, L., occurred on tobacco in 3 plantations, and infested leaves withered at the edges.

Park (M.) & Fernando (M.). **The Nature of Chilli Leaf-Curl.**—*Trop. Agriculturist* **91** no. 11 pp. 263–265, 1 pl., 3 refs. Peradeniya, 1938.

Johnpulle (A. L.). **Chilli Leaf-curl Experiments I. Preliminary Infection Tests.**—*Op. cit.* **92** no. 1 pp. 28–30, 2 pls., 3 refs. Peradeniya, 1939.

In the first paper, a description is given of the leaf malformation of chillies (*Capsicum frutescens*) known as leaf-curl that occurs in Ceylon. The disease was not transmitted by mechanical inoculation, or

affected by the nutritive value of the soil, and microscopic examination of affected plants did not reveal the presence of any pathogenic fungus or bacterium. Plants suffering from leaf-curl were found to be infested by thrips, mites and Aphids, but the symptoms disappeared in plants protected from infestation whereas they continued in those exposed to it. It is probable, therefore, that the disease is due to direct injury by insects or mites, and not to an insect-borne virus.

In the second paper, experiments are described showing that a species of thrips was responsible for the injury. M. C. Cherian has reported that leaf-curl of chillies in India is due to the attacks of *Scirtothrips dorsalis*, Hood, but it is not known whether this species is also responsible for it in Ceylon.

KABOS (W. J.). **Over de biologie van** *Merodon equestris* **Fabr. (Narcisvlieg).** [On the Biology of the Narcissus Fly, *M. equestris*.] —*Ent. Ber.* **10** no. 227 pp. 136–139. Amsterdam, 1939.

In spite of the application of control measures, the Syrphid, *Merodon equestris*, F., has continued to spread in Holland and now occurs on narcissus wherever it is grown. The larvae become full-fed in autumn, but remain in the bulbs until the following spring, when they usually pupate in the soil. In breeding experiments, they left the bulbs at the end of February; the first adults appeared at the end of March and the last on 3rd May, the pupal stage thus lasting about 5 weeks. In the field, adults were taken on 16th May in a locality near Amsterdam and in the second half of June in Amsterdam, while one adult was captured early in August on the island of Texel. There is, however, only one generation a year. Four varieties of the fly were bred out, and brief descriptions of these are given. Oviposition occurred only in sunlight, the eggs being deposited sometimes on the plants and sometimes not. The infestation of the bulbs by the larvae is described.

[MILISAVL'EVIĆ (D.).] **Милисављевић (Д.). Recherches sur l'***Eudemis* **dans les vignobles de Vršac.** [*In Serbian.*]—*Arh. Min. Pol'oprivr.* **5** no. 13 pp. 113–119, 1 graph, 9 refs. Belgrade, 1938. (With a Summary in French.)

The vine moth, *Polychrosis botrana*, Schiff., has been established in the Province of Banat in north-eastern Jugoslavia apparently since 1898. With a view to determining the correct dates for the application of control measures against it, investigations on its seasonal occurrence [*cf. R.A.E.*, A **26** 720] were carried out in the district of Vršac in the summer of 1937. To determine the flight periods of the moths, baits of 10–15 per cent. fermenting molasses, or wine lees with the addition of 10 per cent. vinegar, in water were placed in containers on poles half the height of the vines at 10 points in a vineyard. Daily counts of the captured moths were made from 13th April to the end of September, and fresh bait was added every evening. The results, which are tabulated, showed that three distinct generations of the Tortricid emerged. The flight periods of adults of the overwintering and first generations lasted from 20th April to 30th May and from 16th June to 16th July, respectively, the numbers of individuals caught totalling 262 and 204. Second-generation adults emerged in unexpectedly large numbers, a total of 1,369 individuals being taken during the flight period, which lasted from 27th July to 12th September, and

severe damage was caused by the resulting larvae. The numbers of days without rain between the flight periods were 10 and 9.

It is concluded that in this district collective control of the first two generations of the Tortricid would reduce the numbers of third-generation larvae, which cause the greatest injury. The best insecticides against the larvae are arsenicals, but they cannot be applied against those of the third generation owing to the danger of residues on the grapes.

KLINKOWSKI (M.). **Beobachtungen über Krankheiten und Schädlinge iberischer Wildformen von Serradella und Lupine.** [Observations on Diseases and Pests of Iberian wild Forms of Serradella and Lupin.]—*Z. PflKrankh.* **49** pt. 5 pp. 305–321, 13 figs., 3 pp. refs. Stuttgart, 1939.

The following is taken largely from the summary of this paper on pests and fungous diseases of native wild lupins (*Lupinus*) and serradella (*Ornithopus*) in Spain, Portugal and Spanish Morocco. In Portugal, *Bruchus* (*Bruchidius*) *seminarius*, L., was recorded, for the first time, as a pest of *Ornithopus*, seeds of all the species present being infested, while a Cecidomyiid of the genus *Asphondylia* caused the formation of galls on the pods of *O. sativus* and *O. isthmocarpus*. Of two pests that were not identified, one infested stored seeds of *O. sativus* and the other injured the pods of *O. perpusillus*, apparently in order to reach the seeds. *Etiella zinckenella*, Treit., is widely distributed in Europe, but there are few records of this Pyralid from lupin, since the damage that it causes to cultivated forms of yellow lupin (*L. luteus*) and blue lupin (*L. angustifolius*) is occasional and slight. In the Iberian Peninsula, it attacks wild varieties almost exclusively. It did not attack *L. hirsutus*, was comparatively rare on cultivated forms of *L. albus*, and was common on *L. luteus*, *L. angustifolius* and *L. rothmaleri*. A few larvae of *E. zinckenella* were parasitised by the Ichneumonid, *Pimpla roborator*, F.

Bruchus (*Spermophagus*) *cisti*, F., was not found in Spain or Portugal although it causes severe damage to wild lupins in South Italy and Sicily [*R.A.E.*, A **27** 201], and only fungous diseases are recorded from Spanish Morocco.

BERNHARDT (E.). **Versuche zur Bekämpfung des Maikäfers mit Kontaktmitteln.** [Experiments in the Control of Cockchafers with Contact Insecticides.]—*Z. PflKrankh.* **49** pt. 5, pp. 321–338, 5 refs. Stuttgart, 1939.

A detailed account is given of experiments in Schleswig-Holstein with proprietary sprays and dusts containing dinitro-o-cresol against cockchafers [*Melolontha*], a summary of which has been already noticed [*R.A.E.*, A **27** 171]. In 1937, dusts were found unsuitable, as they were blown from the hedges by wind, but work on a large scale in 1938 showed that sprays were of considerable value.

BLUNCK (H.). **Natürliche Feinde und biologische Bekämpfung der Maikäferengerlinge.** [Natural Enemies and biological Control of Cockchafer Larvae.]—*Z. PflKrankh.* **49** pt. 5 pp. 338–381, 19 refs. Stuttgart, 1939.

Continuing his series of papers on the control of *Melolontha* spp. [*R.A.E.*, A **27** 100, etc.], the author reviews from the literature and his

own observations the natural enemies of the larvae. They include mammals, birds, Diptera, mostly Tachinids, mites, parasitic worms, Gregarines, fungi and bacteria. Although the larvae are attacked by fewer species than the adults, their effect on the population is greater.

Summing up this series of papers, the author concludes that no one effective remedy for infestation by *Melolontha* exists, but that a combination of several must be tried in endeavours to prevent or control dangerous outbreaks.

Götz (B.). **Untersuchungen über das Geschlechtsverhältnis bei den Traubenwicklern** *Clysia ambiguella* **und** *Polychrosis botrana*. [Investigations on the Proportion of the Sexes in the Vine Moths, *C. ambiguella* and *P. botrana*.]—*Anz. Schädlingsk.* **15** pt. 4 pp. 37–43, 3 graphs, 6 refs. Berlin, 1939.

In view of the conflicting results obtained by workers on the ratios of the sexes in *Polychrosis botrana*, Schiff., and *Clysia ambiguella*, Hb., observations on them were carried out in the summers of 1937 and 1938 in Germany in vineyard districts on the Rhine. The moths were captured in glass jars baited with left-over wine to which 1 per cent. sugar and 4 per cent. vinegar were added. The percentages of males and the total numbers taken are shown. The ratios in both species varied in different localities during a single flight period, and in a given locality in different generations, so that no definite conclusion could be formulated. In any single generation and locality, the proportion of males in the population was usually greater in *P. botrana* than in *C. ambiguella*, but further observations are required to confirm this relationship. The proportions of males in both species were usually highest at the beginning of a flight period and then decreased steadily until finally almost only females were present.

The significance of the sex ratio with respect to the growth of populations and the occurrence of outbreaks is briefly discussed. A single male of *P. botrana* has been observed to fertilise three females [*R.A.E.*, A **23** 393]. If this represents the true capacity of the males, the optimum ratio of males to females in this species would be 1 : 3. It is considered, however, that in nature considerable variations occur, owing to unfavourable conditions of climate and feeding.

Whitcomb (W. D.). **The Carrot Rust Fly.**—*Bull. Mass. agric. Exp. Sta.* no. 352, 36 pp., 4 pls., 3 figs., 24 refs. Amherst, Mass., 1938.

Much of the information in this account of the bionomics and control of *Psila rosae*, F., infesting carrots in Massachusetts is similar to that in a previous one [*R.A.E.*, A **17** 725]. All stages of the fly are briefly described, and its distribution is discussed from the literature. The larvae entered the soil for pupation and hibernation between the beginning of September and the time when the soil froze, and the adults usually emerged between mid-May and mid-June. Most emergence took place from slightly or moderately moist soil [*cf.* **20** 406] and at temperatures of 60°F. or less [*cf.* **21** 418]. Eggs were deposited within two inches of the carrots, between the end of May and the end of June. Oviposition began 1–2 days after emergence, reached its maximum on the third day, and continued throughout the life of the female. The duration of development from egg to adult averaged 9–11 weeks, and adults emerged from the third week in July until the first week in September, most of them in the

first three weeks of August. Second-generation eggs were deposited in August and hatched in about 6 days, and the larval stage lasted about 4 weeks. The number of eggs laid and their survival were greatly reduced by hot dry weather, and even under the most favourable conditions in the laboratory, the number of eggs deposited was only a third as great as in the preceding generation. Second-generation larvae attack the roots from August until the soil freezes. It seems probable that there is a partial third generation in some seasons.

Carrots grown from seed sown before 1st or after 15th June are liable to attack by larvae of the first and second generations, respectively. Irrigation of the soil close to the plants favours oviposition. All infested carrots should be pulled up and the larvae destroyed, since ground in which infested carrots had been left through the winter contained 26–80 times as many pupae in the spring as that from which the carrots had been removed. Planting carrots and onions in alternate rows reduced infestation slightly, and early and late crops of carrots or celery should not be grown in the same season. Laboratory experiments showed that derris gave the best control of both eggs and adults, particularly when used as a dust. Undiluted derris dust gave complete mortality in 24 hours of adults caged with plants dusted 4 days previously [*cf.* **17** 725], but was only partially effective on those dusted 5 and 6 days previously. Corrosive sublimate [mercury bichloride], sodium fluosilicate, pyrethrum, sulphur and Bordeaux-oil emulsion protected the plants, but did not kill the flies quickly. No larvae hatched from eggs sprayed in the laboratory with corrosive sublimate (1 : 1,000), Derrisol (1 : 250), or an emulsion of 1 per cent. oil in Bordeaux mixture, or dusted with 4 per cent. mercurous chloride in lime, or undiluted ground derris root (5 per cent. rotenone), but mortality in the controls was 80 per cent. In field experiments only derris and cubé were effective. Naphthalene flakes [**25** 719], Scotch soot and ground tobacco [**20** 406 ; **22** 418], 3–4 applications of which were made on early carrots and 3–5 on late ones, repelled the adults, and naphthalene and tobacco gave some mortality of eggs and newly hatched larvae. Talc and wood ash repelled very light infestations. Insecticides should be applied while the adults are active and eggs are being laid ; 3–4 applications at weekly intervals should be made from the beginning of June and the beginning of August against the first and second generations, respectively. Treating the seed with half its weight of mercurous chloride protected carrots from damage by the first generation, but was less successful against the second, and it was necessary to put the chloride in the drill as well as on the seed. A mixture of mercurous chloride and clay was less effective, and one of corrosive sublimate and clay injured the seed.

DITMAN (L. P.). **Practical Aspects of Pea Aphid Control.**—*Trans. Peninsula hort. Soc.* 1938 pp. 136–141. Dover, Del., [1939].

In this paper are given the results obtained by several growers in Maryland against the pea aphis [*Macrosiphum onobrychis*, Boy.] on canning peas by means of dusts and sprays of derris or cubé, and their value is estimated by comparing Aphid populations and yields in treated fields with those obtained in experimental plots. Dusting was seldom as effective in the field as in the experiments. Effective control was obtained in some cases by single applications at the rate of

30–40 lb. per acre of derris or cubé dusts (containing 1 per cent. rotenone) at night, but dusting in the daytime was unsatisfactory. The results of spraying with 3 lb. derris or cubé (4 per cent. rotenone) per 100 U.S. gals. water, with a wetting agent, were more consistent, and were fair compared with the experimental results. In both dusts and sprays, derris was more effective than cubé.

Jones (S. C.). **Sprays control Prune Thrips.**—*Better Fruit* **33** no. 9 pp. 3 & 16, 2 figs. Portland, Ore., 1939.

In Oregon, the prune thrips [*Taeniothrips inconsequens*, Uzel] has repeatedly caused severe injury to prunes. It has one generation a year. The adults emerge from hibernation when the blossom buds are swelling, maximum emergence occurring when 20–30 per cent. of them show green at the tips, enter the buds and feed on the blossom stems, on which the females begin to oviposit after about 20 days. The larvae hatch just before or during the blossoming period, and feed on parts of the flowers, the young fruits and the foliage. They become full-fed in 2–3 weeks, fall to the ground and enter the soil, in which they construct cells at depths of 4–36 ins., and remain until the following spring. Pear, prune, cherry and broad-leaf maple [*Acer macrophyllum*] are its preferred food-plants.

Effective control is given by sprays, diluted with water to make 100 U.S. gals., containing 1 U.S. pint nicotine sulphate (40 per cent.) with either 2 per cent. miscible oil (viscosity 102–110 seconds Saybolt, unsulphonated residue 65 per cent.), 5 lb. fish-oil soap, or 3 U.S. gals. lime-sulphur (32° Baumé). A coarse driving spray should be applied to all parts of the tree when 20–30 per cent. of the blossum buds show green at the tips. Second and third applications are necessary when all the buds show green at the tips, and when the blossom stems lengthen and the buds show white at the tips, if there are as many as 90 thrips per 100 buds at these times.

Edwards (W. D.) & Zeller (S. M.). **Insect Pests and Diseases of Strawberry in Oregon.**—*Sta. Bull. Ore. agric. Exp. Sta.* no. 357, 30 pp., 19 figs. Corvallis, Ore., 1938.

A list is given of the commoner insect pests of strawberries in Oregon, with notes on the life-history and control of the more important of them. In addition to well-known ones, they include the Tortricid, *Cnephasia longana*, Haw. [*R.A.E.*, A **23** 134; **25** 241], the larvae of which feed on the pollen and tunnel in the developing berries and sometimes also feed on the foliage as typical leaf-rollers. The suggested control measures are mowing or burning wild flowers near strawberry plantings in late May or early June and removing infested fruit.

Furniss (R. L.). **Insects attacking Forest Products and Shade Trees in Washington and Oregon in 1937.**—*Proc. ent. Soc. B.C.* no. 35 pp. 5–8. Victoria, 1939.

In this series of notes on insects recorded as causing injury to forest products and shade trees in Washington and Oregon in 1937, it is stated that winged forms of *Lasius niger* var. *sitkaënsis*, Pergande, which emerged on warm days for two or three weeks, were abundant in dwellings in mid-September. This ant had constructed its chambers in moist rotten wood mined by *Zootermopsis angusticollis*,

Hagen. Elimination of rot and of the termites would give the best control. In July, a severe infestation of dry unrotted wood of Douglas fir [*Pseudotsuga taxifolia*] by the Anobiid, *Hadrobregmus gibbicollis*, Lec., was found in an old house at Puyallup, Washington. Wide-grained wood was preferred to narrow-grained, and sapwood to heartwood. This is the first record of this type of damage by *H. gibbicollis* in the Pacific North-west, where it may, however, become an important pest. Adults were also found attacking *Prunus emarginata* in Oregon, and were reared from branch wood of *Acer macrophyllum* in Washington. Adults of the Cerambycid, *Opsimus quadrilineatus*, Mannh., were reared from seasoned timber of Douglas fir in a house built 7 or 8 years previously. Early in July, adults of *Buprestis langi*, Mannh., emerged from timber of Douglas fir that had been in use for 11 years on the docks in Vancouver, Washington, and in February, larvae of *Prionus californicus*, Motsch., were taken from decaying bridge timbers of the same wood. Some damage to timber in dwellings by *Callidium antennatum hesperum*, Csy., *Reticulitermes hesperus*, Banks, *Camponotus maculatus* subsp. *vicinus*, Mayr, and possibly *C. laevigatus*, Smith, was reported, as well as injury to furniture and flooring by *Lyctus* sp. and to furniture by *Polycaon stouti*, Lec.

Pests of shade trees included *Cryptorrhynchus lapathi*, L., on willow, *Galerucella luteola*, Müll. (*xanthomelaena*, Schr.) on elm, *Chermes* (*Adelges*) *piceae*, Ratz., on grand fir [*Abies grandis*] and *C.* (*A.*) *tsugae*, Annand, on western hemlock [*Tsuga heterophylla*]. In general, infestation by *Stilpnotia salicis*, L., was light in Washington, and it was apparently effectively controlled by the introduced parasites, *Meteorus versicolor*, Wesm., *Apanteles solitarius*, Ratz., and *Compsilura concinnata*, Mg. [*cf. R.A.E.*, A **26** 590]. It was also successfully attacked by a native parasite, *Tachinomyia similis*, Will., and many of the larvae in one area were killed by wilt disease. *A. solitarius* was reared from the larvae in Oregon, where it has not previously been taken.

Clausen (C. P.). **The Effect of Host Size upon the Sex Ratio of Hymenopterous Parasites and its Relation to Methods of Rearing and Colonization.**—*J. N. Y. ent. Soc.* **47** no. 1 pp. 1–9, 15 refs. New York, N.Y., 1939.

The author discusses a number of instances from the literature showing that the sex ratios in Hymenopterous parasites are not even approximately constant under either field or laboratory conditions, but vary with the sex ratio of the host, in successive generations on the same or a different generation of the host, in different hosts, in the same host and in the same season in different geographical regions, and in successive years when the host population is increasing or declining rapidly. The largest hosts yield the greatest proportion of females [*cf. R.A.E.*, A **2** 215 ; **23** 352 ; B **21** 66], and it is suggested that this fact should be utilised in rearing parasites for liberation.

Felt (E. P.). **A new Gall Midge on Rhododendron.**—*J. N. Y. ent. Soc.* **47** no. 1 pp. 41–42. New York, N.Y., 1939.

Descriptions are given of both sexes of the Cecidomyiid, *Giardomyia rhododendri*, sp. n., which was reared from larvae infesting the young

leaves of rhododendron on Long Island. The margins of young leaves are rolled in pale yellowish masses folded over the midrib, and parts of older leaves are marked with brownish spots, which may extend and unite. This Cecidomyiid, injury due to which has been observed on new growth in late May or early June and on second growth in August, appears to be generally distributed in an area within fifty miles of New York City.

Tenhet (J. N.) & Howe (E. W.). **The Sand Wireworm and its Control in the South Carolina coastal Plain.**—*Tech. Bull. U.S. Dep. Agric.* no. 659, 38 pp., 17 figs., 8 refs. Washington, D.C., 1939.

An account is given of observations in 1930–34 on the life-history and control of the sand wireworm, *Horistonotus uhleri*, Horn, on the coastal plain of South Carolina, where it causes severe injury to maize, cotton, cowpeas, potato and native *Lespedeza* and also attacks many other plants [*cf. R.A.E.*, A **3** 693; **4** 511]. Descriptions of all stages and the distribution of this Elaterid, which has not been recorded outside the United States, are given from the literature.

In life-history studies, in which the summer food-plant was maize grown in pots in the soil, the egg, larval and pupal stages averaged 12·25, 352 and 11·5 days, respectively, and the adults survived for 10–14 days. Pairing took place in the late afternoon, immediately after emergence, and the females, which began to oviposit in the soil about a day later, laid most of their eggs, singly or in groups of 2–10, within 5–6 days. The average number of eggs per female was about 50. Most of the larvae hatched in June or July and fed in the surface soil until November, when they gradually migrated deeper. They remained at a depth of 18–24 ins. directly under their food-plants, in a sluggish condition and feeding very little, until March–April, when they returned to the surface soil and continued to feed until about June. They then pupated in cells 4–5 ins. deep in the ground, after spending several days as prepupae, and the adults remained in the cells for 2–3 days before emerging. The sexes were present in equal numbers in cages, but few females are caught in the field, as most of them burrow into the soil to oviposit, within ten minutes of pairing. They fly from fallow ground or pasture to adjacent fields in which a crop is growing, apparently attracted by the scent of growing food-plants.

Adults are present in the field between the end of May and the middle of July, and a few individuals may appear until early September. They feed by rasping the stems and blades of maize and other grasses, and sucking the juices, but cause little damage. The larvae do not feed on organic matter in the soil, but attack the roots and underground parts of the stems of young plants. Seeds of melons, peas and cotton may be attacked as soon as they germinate. The larvae tunnel very little in the stems, and when the plants have passed the seedling stage, injury is less severe. They damage maize by cutting off the small roots as they develop.

In 1931, 8·5 per cent. of the larvae collected in the field were parasitised by a Nematode of the genus *Diplogaster* and died apparently as a result of this parasitism, and in 1934, the Nematode, *Cephalobus persegnis*, was found in dead wireworms reared in the laboratory. The Reduviids, *Oncocephalus geniculatus*, Stål, *Apiomerus crassipes*, F., and *Zelus cervicalis*, Stål, and the spider, *Peucetia viridans*, Hentz, were predacious on the adults, mostly the males,

and larvae of the Therevid, *Psilocephala rufiventris*, Lw., attacked a negligible proportion of the larvae.

The larvae are very sensitive to extremes in soil moisture [*cf.* **8** 509] and in some soils may be drowned as a result of heavy rains. Soil fumigation, which is almost the only direct method of control possible, but which was not tested, is expensive and effective for only a very short time. Methods of indirect control include cultivating alternate halves of the land in successive years, planting resistant crops, arranging a suitable rotation, of which two types are suggested, and maintaining the fertility of the soil. Susceptible crops should not be planted between the middle of April and the middle of June, when the larvae are most injurious, and if the fields are kept free from crops likely to attract ovipositing females until the second week in July, infestation will be reduced in the following year. Seed treatment, insecticides, baits, ploughing and fallowing did not give effective control; light traps attracted males, but not females.

Report of the Puerto Rico Experiment Station 1937.—115 pp., 28 figs., 6 refs. Washington, D.C., 1938.

In investigations carried out in 1937 in Porto Rico, an account of which is given in this Report (pp. 26–37), three introduced species of bamboo, *Bambusa arundinacea*, *B. tulda* and *Dendrocalamus giganteus*, were found to be very resistant to attack by *Dinoderus minutus*, F. Old culms were more resistant than young ones, the lower internodes of the former being more susceptible than the upper ones, whereas the reverse was true of young culms. Attack by the Bostrychid was much less serious in air-dried bamboos and those that had been soaked in water. Soaking the whole culm was found to be preferable to soaking split bamboo, as the exhaustion of nutriment from the wood was greater, owing to root and sprout growth. The degree of infestation was in general inversely proportional to the duration of immersion. Coccids causing blemishes on the culms were identified as *Asterolecanium bambusae*, Boisd., and *A. miliaris*, Boisd. *Chaetococcus bambusae*, Mask., was also present in small numbers, but caused little damage. In the autumn of 1936, many individuals of *A. bambusae* were found to be attacked by a fungus of the genus *Cladosporium*.

In investigations on pests of vegetable crops and other plants (pp. 37–67, 92–95), *Empoasca fabalis*, DeLong, a serious pest of Lima beans, especially the small-seeded varieties, was controlled by repeated applications, at 10-day intervals, of a spray of pyrethrum and soap. Satisfactory control was not given by Bordeaux mixture and nicotine sulphate, or by a proprietary organic thiocyanate. Lima beans were also severely attacked, and some plants killed, by *Elasmopalpus lignosellus*, Zell., though the small-seeded bush varieties showed some resistance. Garden peas, cowpeas (*Vigna sinensis*) and sweet maize were also attacked. *Prodenia ornithogalli*, Gn., damaged garden peas, and *Diaphania hyalinata*, L., various Cucurbitaceae, though watermelons planted near infested cucumbers and muskmelons were not attacked. The Flatid, *Petrusina* (*Ormenis*) *marginata*, Brunn., infested *Jasminum pubescens*, but did little damage. Nearly half the adults were attacked by a fungus of the genus *Isaria*. Larvae feeding on the leaves of vanilla in the propagation house were identified as the Arctiid, *Ecpantheria icasia*, Cram.

Investigations on native and introduced insecticidal plants [*cf. R.A.E.*, A **26** 224] were continued in 1937 (pp. 67–73). *Calopogonium orthocarpum* and *C. coeruleum*, which are indigenous in Porto Rico, gave a positive reaction to the Durham test in the hypocotyl of the seed, and *Amorpha fruticosa* gave a moderately positive reaction in roots and stems and a strong reaction in the seed. These species had not previously been reported to contain rotenone. *Tephrosia vogeli* gave a distinctly positive reaction in the leaves and young stems, and since it grows to its maximum development of leaves in as short a time as 5–6 months, it may prove a more economic source of rotenone than *Derris* or *Lonchocarpus*. Infestation of the pods of *T. toxicaria* by *Brachyacma palpigera*, Wlsm., and *Etiella zinckenella*, Treit., was found to be higher in summer, when the rainfall and relative humidity were high, than in winter, when they were low. Larvae of *Acolastus amyntas*, F., were observed on young plants of *Derris elliptica* for the first time. In plant-disease investigations (pp. 82–92), the occurrence of bunchy top, a disease of papaya (*Carica papaya*) that has appeared in Porto Rico of recent years, was found to be correlated with the presence on the plants of insects [*cf.* **26** 288], but attempts to transmit it by transferring examples of various Rhynchota from diseased to healthy plants were unsuccessful.

Introductions of beneficial insects (pp. 95–103) [*cf.* **25** 424 ; **26** 275, 329] included 88 adults of the Chalcid, *Dirhinus giffardi*, Silv., from Hawaii for the control of fruit-flies of the genus *Anastrepha*, and sufficient numbers for liberation at the end of the year were reared on puparia of the house-fly [*Musca domestica*, L.]. A list is given of 6 native parasites bred from *A. fraterculus* var. *mombinpraeoptans*, Seín, and *A. suspensa*, Lw. The Braconid, *Opius anastrephae*, Vier., which was obtained from both species, was the only one that exercised any effective control, the percentage parasitism by it of *A. f. mombinpraeoptans* ranging up to 49·9. No recoveries have as yet been made of *Ipobracon rimac*, Wolc., or various Tachinids, all introduced during 1935 and 1936 for the control of *Diatraea saccharalis*, F., on sugar-cane. Examples of *Microdus* (*Bassus*) *stigmaterus*, Cress., parasitising 4·8 per cent. of the larvae of *D. saccharalis* were recovered in January 1936 for the first time since the liberation of this Braconid some years previously, but none was found in larvae collected in August 1936, after a severe drought, or in March 1937. The Tachinid, *Lixophaga diatraeae*, Tns., was the only native parasite reared from *D. saccharalis* ; the percentage parasitism by it averaged only 9·6, but it is of economic importance under favourable conditions. The Coccinellids, *Azya trinitatis*, Mshl., and *Cryptognatha nodiceps*, Mshl., introduced from Trinidad in 1936 against *Aspidiotus destructor*, Sign., have become well established, and consignments of adults of both species were sent to Santo Domingo in May 1937. Early in 1937, *Hambletonia pseudococcina*, Comp., and *Anagyrus coccidivorus*, Doz., were introduced from Hawaii for the control of *Pseudococcus brevipes*, Ckll., on pineapple. These Encyrtids were reared in the laboratory, and later, 2,417 adults of *H. pseudococcina* and 179 of *A. coccidivorus* were liberated. Their life-cycles in the laboratory lasted 26 and 21 days, respectively. *H. pseudococcina* has apparently become established ; very few males were produced, whether the females were fertilised or not, so that reproduction in this species may be considered parthenogenetic.

Three native wasps observed to be predacious on larvae of *Laphygma frugiperda*, S. & A., on maize were identified as *Polistes crinitus* var. *americanus*, F., *P. major*, P. de B., and *Mischocyttarus phthisicus*, F. *Sceliphron caementarium*, Drury, was present in the same maize field in smaller numbers, but was not actually seen feeding on *L. frugiperda*. An undescribed Bethylid of the genus *Perisierola*, near *nigrifemur*, Ashm., was the only native parasite of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., on cotton.

Rahman (K. A.). **Annual Report on the Combined Entomological Scheme, Punjab and N.-W.F.P. for the Year 1937–38.**—18 pp. Simla, 1938.

In this first annual report of the combined survey of insect pests of fruit trees in the Punjab and the North-West Frontier Province, begun in April 1937, particular attention is given to the San José scale, *Aspidiotus* (*Aonidiella*) *perniciosus*, Comst., which has been the most important of these in the Punjab since 1928. Lists are given of the localities in which it was found and the plants on which it was taken. A list of the Coccids collected includes *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., not previously recorded from these Provinces, which is increasing rapidly on *Citrus*. The Lamiid, *Apriona cinerea*, Chevr., was recorded for the first time causing serious injury to the trunks and branches of apple, and the adults of the Galerucid, *Mimastra cyanura*, Hope, which usually occurred in very large numbers, skeletonised leaves of peach, pear, and almond in May and June. Of the fruit-flies that were taken, *Carpomyia vesuviana*, Costa, which was active from the end of August to the end of December, was found damaging ber [*Zizyphus jujuba*]. *Eurytoma samsonovi*, Vass., is widely distributed and spreading in the North-West Frontier Province, but was not found in the Punjab. This Eurytomid causes considerable injury to the fruits of apricot, from April–May, and also attacks peach and plum.

Compere (H.). **A second Report on some miscellaneous African Encyrtidae in the British Museum.**—*Bull. ent. Res.* **30** pt. 1 pp. 1–26, 6 figs. London, 1939.

The African Encyrtids dealt with in this paper [*cf. R.A.E.*, A **27** 39] comprise 12 species of *Anagyrus*, 3 of *Tropidophryne*, 6 of *Microterys*, 5 of *Bothriophryne*, 1 of *Leptomastix*, 1 of *Neodiscodes*, 1 of *Leptomastidea* and 2 of *Cheiloneurus*. Those described as new are *A. abyssinicus* and *A. pullus* reared from *Pseudococcus* spp. in Eritrea; *A. bugandaensis* from *P. kenyae*, Le Pelley, and *A. niger* from *Pseudococcus* spp. in Uganda; *A. nigrescens* and *A. amoenus* from *Pseudococcus* spp. in the Transvaal; *A. kivuensis* from *Pseudococcus* sp. in the Belgian Congo; *T. natalensis* presumably from *P. citri*, Risso, in Natal; *T. melvillei* from *Pseudococcus* sp., and *M. umbrinus* from *Ceroplastes* on coffee, in Kenya; *M. nicholsoni* from *Saissetia perseae*, Brain, *Coccus hesperidum*, L., and *S. oleae*, Bern., in Natal; *M. bizanensis* from *S. cuneiformis*, Leon., in Eritrea; *B. fuscicornis* and *B. purpurascens* from *Ceroplastes* spp. in South Africa; and *B. dispar* from *Ceroplastes* sp. in Tanganyika. Keys are given to the females and known males of the African species of *Anagyrus*, the females of the African species of *Microterys* and the females of the species of *Tropidophryne* and *Bothriophryne*, and also

one for the separation of *Trichomasthus* from *Bothriophryne*. *T. tenuicornis*, Mercet, is transferred to *Bothriophryne*. The characters common to the species of the *subproximus* group of *Anagyrus* are given, and the generic description of *Tropidophryne* is amended. The Australian species *flandersi*, Compere, is stated not to be congeneric with the species of *Tropidophryne* included here.

HANSON (H. S.). **Ecological Notes on the *Sirex* Wood Wasps and their Parasites.**—*Bull. ent. Res.* **30** pt. 1 pp. 27–76, 6 pls., 15 refs. London, 1939.

The following is taken from the author's summary : An ecological study of wood wasps of the genus *Sirex* and their parasites was begun in Britain in 1927 and continued while parasites were being collected for shipment to New Zealand for the control of *Sirex noctilio*, F. The life-histories of *Sirex* and of the parasites, *Ibalia leucospoides*, Hochenw., and *Rhyssa persuasoria*, L., are outlined, and the differences in the methods by which the parasites attack the host are described. Particulars are given of the methods used in making collections and the numbers of parasites taken. It is shown that a single generation of *Sirex* can support three generations of *Rhyssa* and one of *Ibalia*, and that the effects of parasitism by *Rhyssa* are cumulative. *Rhyssa* is intrinsically superior to *Ibalia*, and superparasitism of *Ibalia* by *Rhyssa* occurs frequently. The percentage parasitism by each species alone may be very high, but it is higher when the two species occur together. Parasitism by *Rhyssa* is highest when *Sirex* is breeding in wood under 3 ins. in diameter, as the host larvae are then within reach throughout their development. Tables are given showing the stages of *Sirex*, *Rhyssa* and *Ibalia* that a log may be expected to contain in either summer or winter over a period of four years when one generation of *Sirex* is present, the inter-relationship of host and parasites over a period of seven years when three generations of *Sirex* are present in the same piece of timber, and the generation of *Sirex* from which each generation of *Rhyssa* may arise in the latter case. A large tree may support a population of more than 3,000 individuals of *Sirex* and its parasites during a period of seven years.

Agents other than insect parasites that may exercise control are discussed. Birds are thought to be normally of little importance. Fungi may destroy pupae and adults of *Sirex*, but they cause the death of the trees and help to increase the amount of suitable breeding material. Climatic conditions cause little mortality and probably do not alter the ratio of host to parasite.

For successful oviposition in living trees, the limiting factors are rapidity of transpiration and activity of the cambium. Freshly felled, sound timber is preferred. Although trees killed by *Fomes annosus* and *Armillaria mellea* are readily attacked, the part of the timber permeated with the mycelium of the fungi is unsuitable for the development of the insect.

Sirex is under economic control in Britain; this is attributed chiefly to parasitism by *Rhyssa* and *Ibalia*. An example of adverse criticism of biological control is examined. The present status of *S. noctilio* in New Zealand is discussed, and the presence of *Hylastes ater*, Payk., on pines is mentioned as a factor likely to contribute to its rapid increase. An account is given of the introduction and establishment of *Rhyssa* in New Zealand [*R.A.E.*, A **23** 498; **26** 58], and suggestions are made

for the reduction of mortality in transit. Silvicultural and mechanical control and biological control are compared, and it is concluded that the latter is the more satisfactory and economical.

WILKINSON (D. S.). **On two Species of *Apanteles* (Hym. Brac.) not previously recognised from the Western Palaearctic Region.**—*Bull. ent. Res.* **30** pt. 1 pp. 77–84, 4 figs. London, 1939.

In this paper, *Apanteles compressiventris*, Mues., which has not previously been recorded in the Old World, and *A. plutellae*, Kurdj., which has not previously been recorded from the Western Palaearctic Region, are redescribed, and records of their distribution in these areas and emendations to the author's key [*R.A.E.*, A **21** 135; **22** 487] are given. All the material from which *A. compressiventris*, which was originally described as a parasite of an Arctiid, is redescribed was from Arctiid hosts, with the exception of one series where a mistake may well have been made. A total of 141 cocoons from a single larva of *Arctia villica*, L., was observed. *A. plutellae* is redescribed from Lepidopterous hosts belonging to several genera, including *Plutella maculipennis*, Curt., *Pieris rapae*, L., and *P. brassicae*, L.

CLEARE (L. D.). **The Amazon Fly (*Metagonistylum minense*, Towns.) in British Guiana.**—*Bull. ent. Res.* **30** pt. 1 pp. 85–102, 1 fig., 19 refs. London, 1939.

A detailed account is given of the rearing of *Metagonistylum minense*, Tns., in British Guiana between September 1933 and April 1935, following its introduction from Brazil for the control of *Diatraea* on sugar-cane [*cf. R.A.E.*, A **22** 388, 566]. The total life-cycle of the Tachinid usually lasted 15–19 days. Eggs, which hatch immediately, are deposited on the cane stalk. One larva or more may enter a single host. When fully developed, the larva leaves the dead host and pupates within its tunnel, behind a leaf-sheath or on the ground. Emergence appeared to depend on temperature and humidity, and the occurrence of pairing, which takes place from about 2 hours to some 6 days after emergence, depended on the intensity of light. The period between pairing and oviposition lasted about 6 days. Most adults lived 10–12 and some 21 days. Dissected females contained 180–991 eggs and larvae. *D. saccharalis*, F., is the preferred host. Larvae rarely develop beyond the second instar in *D. canella*, Hmps. [**26** 221]. The cost of introduction is discussed. It is estimated that the cost of introducing the Tachinid into British Guiana, as distinct from colonisation, did not exceed £5,000. An account is given of an investigation of the status of *M. minense* in British Guiana in 1937 [**26** 491], and shipments of the Tachinid to St. Lucia, where it has become established [**26** 121], Porto Rico and Trinidad are reported.

NIXON (G. E. J.). **New Species of Braconidae (Hymenoptera).**—*Bull. ent. Res.* **30** pt. 1 pp. 119–128, 3 figs., 3 refs. London, 1939.

The following new Braconids are described from India: *Spathius critolaus*, reared from *Sinoxylon* and *Pempheres* and from seeds of *Prosopis spicigera*; *Spathius labdacus* and *Rhaconotus cleanthes*

from *Pempheres affinis*, Fst.; and *R. menippus* from *P. affinis*, *Lixus* sp., and *L.* (*Hypolixus*) *truncatulus*, F. *R. menippus* var. *africanus* is described from South Africa. A key is given to the females of the Indian species of *Rhaconotus*.

FERRIÈRE (C.). **Chalcid Flies attacking noxious Beetles in India and New Guinea.**—*Bull. ent. Res.* **30** pt. 1 pp. 163–168, 3 figs. London, 1939.

The Chalcidoids described as new are *Eurytoma promecothecae* reared from *Promecotheca papuana*, Csiki, in New Britain (Territory of New Guinea); and *Dinarmus coimbatorensis*, *Eupelmella pedatoria* and *Entedon pempheridis*, all from *Pempheres affinis*, Fst., and other weevils in South India. The other species dealt with, all of which were taken as parasites of *Pempheres* in South India, are *Aplastomorpha calandrae*, How., *Eupelmus urozonus*, Dalm., *Bruchocida orientalis*, Crwf., and *Euderus pempheriphila*, Ram. Ayyar & Mani.

COMPERE (H.). **Description of a new Species of** *Leptomastix* **parasitic in** *Phenacoccus hirsutus*, **Green.**—*Bull. Soc. Fouad 1er Ent.* **22** (1938) pp. 36–38. Cairo, 1939.

Descriptions are given of both sexes of the Encyrtid, *Leptomastix phenacocci*, sp. n., which was introduced into Egypt from Java and is abundant at Cairo, where it parasitises *Phenacoccus hirsutus*, Green.

SHAFIK (M.). **Constant temperature hot air Sterilizer for the Control of** *Ephestia* **and** *Myelois* **on Dates.**—*Bull. Soc. Fouad 1er Ent.* **22** (1938) pp. 233–264, 5 pls., 1 fig. Cairo, 1939.

SHAFIK (M.) & HILMY (A. L.). **A mud brick Oven for drying Dates and controlling** *Ephestia*.—*T.c.* pp. 265–273, 2 pls., 1 fig., 1 ref.

Dates obtained from the Baharia and Siwa Oases in April 1938 were found to be infested by larvae of *Ephestia calidella*, Gn., *E. cautella*, Wlk., *E. figulilella*, Gregson, *Myelois ceratoniae*, Zell., *Syria* sp. and *Euzophera* sp. Of these, *M. ceratoniae*, which had not previously been recorded from dates in Egypt, and *E. calidella* were by far the most numerous and occurred in approximately equal numbers. The degree of infestation varies; it is highest at Siwa Oasis and in Sharkia.

The moths oviposit in semi-dry and hard dates and the outer layers of bales of sticky dates, which are pressed in bags while they are still soft; fresh fruits are rarely infested, but the author considers incorrect the statement that those still attached to the fruiting stalks are not attacked [*R.A.E.*, A **6** 462]. Infestation of semi-dry dates (containing 20–25 per cent. moisture) begins during the drying process, which takes place in the sun and lasts up to two weeks; the crops ripen from early October to mid-November, and the dates may be gathered and the drying process begun a few days before they are ripe. The larvae continue their development in the dates in stores and in rejected fruits left in the drying yards. Hard dates are left to dry on the trees, and infestation, which is generally heavy, begins during this process; larval development is completed in the stored fruits. Semi-dry dates left in the drying yard and hard dates in store provide sources of infestation for the following year.

As control by fumigation is impracticable in the Oases, a control measure that could easily be carried out by inexperienced workers was

required. The literature relating to the development of hot-air sterilisation against various insects in stored products is reviewed, and a hot-air oven devised by the author for use against date moths in Egypt is described. It consists of a mud-brick chamber, with double walls separated by an insulating air-space, heated by air that passes through a fire of wood or waste materials and is conducted backwards and forwards across the chamber by means of an iron pipe sunk below the floor. The temperature in the chamber can be regulated by means of a valve in the chimney through which the hot air leaves.

Experiments are described showing that differences between the temperatures at the centre and at any other point in the chamber nowhere exceeded 2°C. [3·6°F.], and that the relative humidity at distances of about 12 and 20 ins. from the centre was fairly constant. Graphs show the temperatures recorded inside the chamber after the heating was discontinued and by an outside thermometer during the same period, and demonstrate the high degree of insulation afforded by the double walls. Further experiments indicated that exposure to a temperature of 60°C. (140°F.) for 1½ hours kills all stages of date moths, and does not harm the dates.

In the second paper, experiments are described which show that the oven can be used for the quick ripening and drying of dates as well as for the control of moths.

PRIESNER (H.). **A brief Note on the Relation between the physiological Condition of Plants and Insect Attack.**—*Bull. Soc. Fouad Ier Ent.* **22** (1938) pp. 279–283, 2 refs. Cairo, 1939.

The author summarises the principal contents of H. Thiem's paper on the relation between infestation by insects, notably *Lecanium* (*Eulecanium*) *corni*, Bch., and the physiological condition of the food-plant [*R.A.E.*, A **27** 112], in which reference is made to the statement by I. Welsch that the progress of an infestation is determined by the physical and not the chemical condition of the soil [**26** 251]. Many insect species, particularly those with sucking mouth-parts, are influenced by physiological variations in the food-plant, and the author instances observations on mealybugs on *Citrus* and vines in Egypt as additional evidence of the importance of this factor.

The internal process that renders a resistant plant susceptible to insect attack must be related to the chemical composition of the cell sap, but it is suggested that the physical condition of the latter is a still more important factor in the case of sucking insects. Further studies are needed to determine the direct causes of fluctuations in the composition of the cell sap, and the extent to which the digestive organs of insects are susceptible to such variations and adapted to fixed degrees of osmotic pressure. The author considers that decreasing cell sap pressure is probably one of the factors causing previously immune plants to become susceptible to infestations, and that the fast-growing parts of plants are preferred by many insects because in them this pressure is low ; from this he concludes that conditions resulting in the dilution of the cell sap are the main cause of a plant becoming attractive to these insects. Variations in the concentration of the cell sap react on the insect by altering the normal balance between the osmotic pressure of the absorbing tissues of the alimentary canal and that of the sap, comparatively high concentrations being fatal to at least the early stages.

Shafik (M.), Amer (A.) & Hilmy (A. L.). **Efficiency of commercial Sodium Cyanide and Sulphuric Acid in liberating Hydrocyanic Acid Gas for the Fumigation of Citrus Trees in Egypt against Scale Insects.**—*Bull. Soc. Fouad 1er Ent.* **22** (1938) pp. 301–345, 1 fig., 27 graphs. Cairo, 1939.

Since the concentration of sulphuric acid imported into Egypt for the generation of hydrocyanic acid gas from sodium cyanide for the fumigation of *Citrus* against scale-insects was found to vary, even in single consignments, experiments, which are described, were carried out in the laboratory to determine the most effective strength and the rate at which the acid should be used. The results are shown in tables and graphs.

The factors on which the effectiveness of the chemical reaction depends include the concentration, volume and temperature of the acid solution, the speed at which the reaction proceeds, and the rate of liberation of the HCN, which tends to polymerise if it is left in contact with sodium cyanide.

Granular and powdered sodium cyanide reacted more quickly than solid lumps, and the use of the granular form is recommended to avoid polymerisation and also to ensure that the maximum concentration of HCN under the fumigation tent is reached within 2–3 minutes, in order to prevent protective stupefaction of the Coccids, which renders the kill ineffective [*cf. R.A.E.*, A **27** 342, 343, etc.]. The recommendations given in a previous paper [**23** 691] are revised as a result of these investigations. The granular sodium cyanide should be used with 95–96 per cent. sulphuric acid and water in the ratio 1 : 0·7 : 2. If the use of granular cyanide in the field is impracticable, the lump form may be substituted and used in the ratio 1 : 1·25 : 1·8. If 98 per cent. acid is readily available, the lump form can be used with it in the ratio of 1 : 0·6–0·7 : 2.

Shafik (M.) & Husni (M.). **The ideal Spray Emulsion for the Control of Scale Insects on Citrus in Egypt.**—*Bull. Soc. Fouad 1er Ent.* **22** (1938) pp. 357–395. Cairo, 1939.

The equipment and organisation available for the fumigation with hydrocyanic acid gas of *Citrus* against Coccids in Egypt are inadequate for the treatment of more than a small proportion of the infested trees, and the development of a method of oil spraying that can be safely and effectively applied by the growers is therefore desirable. The authors briefly review from the literature the use of oils as insecticides and the properties determining their efficiency. Sprays in which the oils are mechanically dispersed and the oil droplets are large are the most effective as insecticides, but the most injurious to plants ; those prepared from stock emulsions, in which the size of the droplets of oil varies, are safe to varying degrees, those with the smallest droplets (permanent emulsions) being the safest, but the least effective. They have, however, given good results in Egypt, without plant injury, for several years. The types of injury caused to plant tissues by hydrocyanic acid gas and oil deposits are briefly described, and the effect of oil on plant growth is discussed from the literature. In Egypt, where a rise in temperature is generally accompanied by increased humidity, spraying can be safely carried out if the oil is applied in small quantities in the form of a permanent emulsion.

Heavy oils should not be used, and applications should not be made during periods of high temperature and low humidity, or when the khamsin wind is prevailing.

The greatest injury to *Citrus* in Egypt is caused by *Chrysomphalus ficus*, Ashm., but it is also attacked by *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., the cottony cushion scale [*Icerya purchasi*, Mask.] and *Lepidosaphes* (*Mytilaspis*). Field trials against various Coccids were made during 1936–38 with a number of proprietary oil emulsions, including an Egyptian emulsion of the permanent (mayonnaise) type containing 75 per cent. white oil (unsulphonated residue not less than 95 per cent.) and which was applied at dilutions varying from 1·5 to 4 per cent. The Egyptian oil emulsion was as effective against *C. ficus* on *Citrus*, *Ficus* and mango as the others, and was sometimes superior to them ; it did not cause scorching or leaf drop. A single application was effective for three months, but after this period reinfestation occurred, especially where the experimental plot was surrounded by untreated infested trees. This oil was also effective against *C.* (*Aspidiotus*) *personatus*, Comst., on *Ficus*. Tar-distillate emulsions were superior to mineral oils against *Pseudococcus citri*, Risso, on guava and *Icerya aegyptiaca*, Dougl., on *Citrus* and guava, but the mortalities given by the Egyptian emulsion were not lower than those from the other mineral-oil sprays. It also gave good results against *Lepidosaphes beckii*, Newm., on *Citrus*, *Parlatoria zizyphus*, Lucas, on *Citrus* and *Ficus*, and *Coccus* (*Lecanium*) *longulus*, Dougl., on custard apple [*Anona*].

It is concluded that high mortalities were obtained, with a wide margin of safety to the plants, when the emulsion was applied at a dilution of 2 per cent. When the plants are heavily infested, two applications during one season are generally required ; heavy reinfestation follows the partial treatment of infested groves.

CASSAB (A.). **Le nid et la ponte des courtilières (Orthoptera : Gryllidae-Gryllotalpinae).**—*Bull. Soc. Fouad 1er Ent.* **22** (1938) pp. 397–399, 2 figs. Cairo, 1939.

An account is given of the way in which Gryllids of the genus *Gryllotalpa* construct their egg-chambers. Females construct as many as five egg-chambers, but the usual number is three. The number of eggs deposited in each of the three chambers varies, and the maxima, minima and averages for examples of *Gryllotalpa gryllotalpa*, L. (*vulgaris*, Latr.) and its brachypterous form, *cophta*, de Haan, and of *G. africana*, P. de B., are shown in a table. In the first, second and third chambers, respectively, averages of 250, 160 and 120 eggs are laid by females of the former species and its variety, and 45, 29 and 19 by those of the latter.

CUMMINS (J. E.). **The Preservation of Timber against the Attacks of the Powder Post Borer (*Lyctus brunneus* Stephens) by Impregnation with Boric Acid.**—*J. Coun. sci. industr. Res. Aust.* **12** no. 1 pp. 30–49, 3 figs., 9 refs. Melbourne, 1939.

In further experiments on the impregnation of timber with preservatives against *Lyctus brunneus*, Steph. [*cf. R.A.E.*, A **24** 373], boric acid alone or in combination with borax was found to have a relatively high toxicity to the larvae. The lethal concentrations of

boric acid alone and boric acid and borax (2 : 1 and 1 : 1 by weight) appeared to be between 0·05 and 0·06, between 0·07 and 0·12 and about 0·05 lb. per cu. ft. of wood, respectively, while that of borax alone was previously shown to be slightly above 0·04. Toxicity appeared to be related to boron content. Zinc chloride had a markedly different action, larval activity occurring when as much as 0·33 lb. per cu. ft. was absorbed, so that although damage was slight and the larvae died in an early stage of development, its use is not recommended. In preliminary tests on the treatment of green sapwood veneer, boric acid alone was found to be preferable to mixtures containing borax, which injured the veneer. Treatment at the green veneer stage is shown to be more effective and economical than treatment at any other stage. Absorption depends on three variable treating factors. With $\frac{1}{16}$ in. veneer and a 1 per cent. solution at 200–212°F., the total absorption approaches the maximum in 15 minutes. For $\frac{1}{8}$ in. veneer, 20 minutes was necessary to assure adequate penetration. The treatment is considered uneconomical for veneer more than $\frac{3}{16}$ in, thick. Field tests were carried out under commercial conditions with a treating solution of 1·25 per cent. boric acid at a temperature of 200–205°F. Tables are given showing the absorption of boric acid by sapwood veneers of different woods and thicknesses and after different exposures, and recommendations are made for the commercial treatment of various Australian timbers. A provisional patent specification for the treatment outlined has been lodged and accepted.

The Control of Silverfish.—*J. Coun. sci. industr. Res. Aust.* **12** no. 1 pp. 85–86. Melbourne, 1939.

Experiments have shown that increasing the quantity of barium fluosilicate in the bait recommended for the control of silverfish [*Ctenolepisma longicaudata*, Esch.] in Australia [*R.A.E.*, A **25** 222] does not affect its attractiveness, and as an increase in toxicity would be advantageous since silverfish consume very little food, it is recommended that the amount of barium fluosilicate in the bait should be increased to 1½ oz. The bait should be spread on both sides of a card, and 10–20 pieces 2×3 ins. allowed to an average-sized room. To protect papers, etc., from attack, E. A. Lindsay recommends their treatment with a 1–2 per cent. solution of tricresylphosphate in refined kerosene applied with a brush or as a spray, or with a saturated aqueous solution of tartar emetic [potassium antimony tartrate].

Evans (J. W.). **The European Earwig.**—*Tasm. J. Agric.* **10** no. 1 pp. 25–26, 1 fig., 1 ref. Hobart, 1939.

Notes are given on the appearance, life-history and habits of *Forficula auricularia*, L., which has been established in Tasmania for a great many years, and damages fruit, vegetables and flowers. There is only one complete generation a year in Tasmania, but each female lays two batches of eggs, one in spring and one in early summer. The eggs, which are laid in nests about 2 ins. below the surface of the soil, hatch in 2–3 weeks. Recommendations for control include the use of traps consisting of boxes or flower-pots filled with straw or crumpled paper and inverted on the ground, or of a bait of 12 oz. sodium fluoride, 2 qts. molasses, 12 lb.

wheat bran and 6 qts. water broadcast late in the evening once in early October, again about 10 days later and a third time during the second week in December.

LINDEMUTH (K.). **Die Bekämpfung des Rapsglanzkäfers.** [The Control of *Meligethes aeneus*.]—*Kranke Pflanze* **16** pt. 5 pp. 94–96, 2 figs. Dresden, 1939. **Berichtigung.** [Correction.]—*T.c.* pt. 6 p. 119.

The increased cultivation of rape in Schleswig-Holstein since 1932 has led to an increase in the population of certain pests of this crop, especially the rape beetle [*Meligethes aeneus*, F.], against which the chief measure of control is catching the overwintered adults before the plants blossom. An apparatus that has proved of value for this purpose is that of Buhl & Meyer, in which the beetles are caught in shallow trays containing a mixture of kerosene and soap solution, three of which are suspended from a bar carried through the field [*R.A.E.*, A **25** 487]. The greatest width of each tray is about 10 ins. for rows 14–17 ins. apart, and 7 ins. for those 10–14 ins. apart. The apparatus is of little use for rows closer together, since the trays would have to be so narrow that few of the beetles would fall into them.

M. aeneus causes even more injury to cabbages and swedes than to rape, and a machine, adapted from that described above, was constructed for use on these plants. A larger tray resembling a narrow flat iron in shape, is mounted, pointed end forward, over a bicycle wheel that projects through it along the centre line. The upper part of the wheel is enclosed in a casing. The tray is provided with handles and is pushed along between the rows. Two boards are fixed at an angle sloping down forwards and outwards, on either side of the wheel casing. They gather in the plants and press them over the tray as the machine passes.

PAPERS NOTICED BY TITLE ONLY.

HEINRICH (C.). **The Cactus-feeding Phycitinae : a Contribution toward a Revision of the American Pyralidoid moths of the Family Phycitidae.**—*Proc. U.S. nat. Mus.* **86** no. 3053 pp. 331–413, 29 pls. Washington, D.C., 1939.

THOMAS (C. A.). **The Animals associated with edible Fungi** [an annotated list of records from all parts of the world].—*J. N. Y. ent. Soc.* **47** no. 1 pp. 11–37, 7 pp. refs. New York, N.Y. 1939.

WILLE (J. E.). **Las queresas de las plantas cítricas y métodos para combatirlas.** [The Coccids of *Citrus* Plants in Peru and Methods for Controlling them.]—*Circ. Estac. exp. agríc. Minist. Fom.* [*Peru*] no. 46 pp. 3–14, 4 pls. Lima, 1939. (2nd revd edn.) [*Cf. R.A.E.*, A **23** 307.]

VENABLES (E. P.). **The Scale Insects of British Columbia** [a list of 14 species, with notes on their distribution and food-plants].—*Proc. ent. Soc. B.C.* no. 35 pp. 23–24. Victoria, 1939.

LUPO (V.). **Revisione delle cocciniglie italiane III.** (*Mytilococcus.*) [A Revision of Italian Coccids III. The Genus *Lepidosaphes* (*Mytilococcus*).]—*Boll. Lab. Zool. Portici* **31** pp. 69–136, 39 figs. Portici, 1939.

ROBERTI (D.). **Contributi alla conoscenza degli afidi d'Italia. II.** (*Chaitophorus hickelianae* **Mimeur,** *Phloeomyzus passerinii* **Sign,** *Patchiella réaumuri* **Kalt.,** *Pemphigus protospirae* **Licht.).** [Contributions to the Knowledge of the Aphids of Italy. II.]—*Boll. Lab. Zool. Portici.* **31** pp. 137–157, 13 figs., 19 refs. Portici, 1939.

WAHLGREN (E.). **Revision von Zetterstedt's lappländischen Aphidina.** [A Revision of the Aphids recorded by Zetterstedt from Lapland.] —*Opuscula ent.* **4** pt. 1–2 pp. 1–9, 18 refs. Lund, 1939.

HOFMANN (C.). **Die neuzeitliche Bekämpfung forstlicher Grossschädlinge mit besonderer Berücksichtigung von Nonne** (*Lymantria monacha* **L.) und Kiefernspanner** (*Bupalus piniarius* **L.).** [Modern Control of major Forest Pests in Germany, with particular Reference to *L. monacha* and *B. piniarius*.]—*Nachr. Schädlingsbekampf.* **14** no. 1 pp. 1–43, 31 figs., 1 pl., many refs. Leverkusen, 1939. (With Summaries in English, French and Spanish.) [*Cf. R.A.E.*, A **27** 231.]

Die ersten Kartoffelkäferfunde im Westen 1939. [The first Records (on 7th, 10th and 23rd April) in 1939 of the Potato Beetle (*Leptinotarsa decemlineata*, Say) in western Germany.]—*NachrBl. dtsch. PflSchDienst* **19** no. 5 p. 44. Berlin, 1939. [*Cf. R.A.E.*, A **27** 160.]

SMOLÁK (J.). **Názvosloví pro škodlivé činitele zelinářských kultur. III. část : Škůdcové živočišní.** [The Nomenclature of Factors injurious to vegetable Crops. Part III. Animal Pests. (List of pests, including over 60 species of insects and mites, given under their popular names in Czech with scientific equivalents.)]—*Ochr. Rost.* **15** pp. 34–35. Prague, 1939.

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GRUNBERG (A.). **Insects injurious to Vegetables and Shrubs in the Jordan Valley, Huleh Area and the Upper Galilee** [an annotated list of 60 species].—*Bull. Soc. Fouad 1er Ent.* **22** (1938) pp. 1–9. Cairo, 1939.

HANNA (A. D.). **Studies on the Mediterranean Fruit-fly :** *Ceratitis capitata* **Wied. I. The Structure and Operation of the Reproductive Organs.**—*Bull. Soc. Fouad 1er Ent.* **22** (1938) pp. 39–59, 30 figs., 2 refs. Cairo, 1939.

VOLKONSKY (M.). **Stries oculaires et âges larvaires chez les acridiens.**—*Arch. Inst. Pasteur Algérie* **16** no. 4 pp. 523–532, 1 fig., 8 refs. Algiers, 1938.

SCHEDL (K. E.). **Scolytidae und Platypodidae. 47. Beitrag.** [Scolytidae and Platypodidae. 47th Contribution (including *Dacryphalus sumatranus*, sp. n., and *Xyleborus myristicae*, sp. n., both from nutmeg (*Myristica fragrans*) in Sumatra).]—*Tijdschr. Ent.* **82** pt. 1–2 pp. 30–53, 12 figs. Amsterdam, 1939.

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